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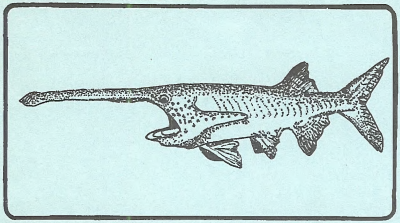

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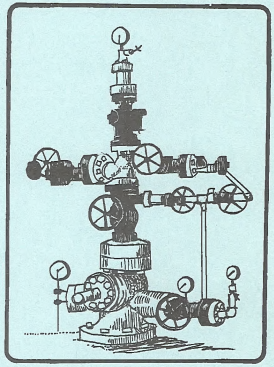
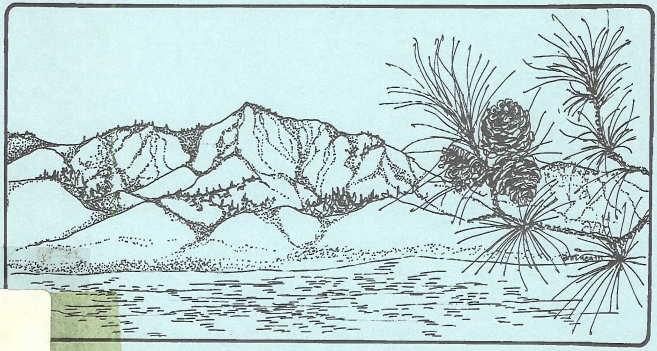


FUELCO

Natural Gas Pipeline

Environmental Assessment Record



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FUELCO ENVIRONMENTAL ASSESSMENT
OPTION SUMMARY

SETTING

In 1978, Fuel Resources Development Company (Fuelco) requested a right-of-way across public lands for a pipeline which would transport natural gas from the south side of the Missouri River in the general area of the Stafford Ferry to a main distribution line on the north side leading to the city of Great Falls.

PUBLIC INVOLVEMENT

During preparation of the Upper Missouri Wild and Scenic River Management Plan, nine public meetings were held. Public opinion about a natural gas pipeline crossing of the river was recorded.

A Draft EA on Fuelco's proposal was prepared and released to the public September 12, 1979. Copies were sent to interested agencies and individuals while other copies were placed in local libraries and BLM offices. Announcements of availability were made through radio and newspaper. Nine letters commenting on the draft were elicited during the comment period.

ISSUES

Wild and Scenic River

The fact that the pipeline crossing would occur in an area designated as the Upper Missouri Wild and Scenic River is an important issue. The majority of the public polled indicated support of the crossing, as long as environmental effects were minimized. All of the suggested river crossing sites are located in the immediate vicinity of the Stafford Ferry, an established transportation corridor. Man made impacts therefore are already present in this portion of the 'Scenic' Missouri River.

The Wild and Scenic River Management Plan states that no oil and gas drilling shall occur within the seen area of the river so as to protect existing scenic qualities.

Wilderness Study Areas

As few as none or as many as two proposed Wilderness Study Areas (WSAs) could be affected by the distribution pipeline, depending on which route would be selected.

With the publication of the "Interim Management Policy and Guidelines for Lands under Wilderness Review" (IMP) on December 12, 1979, policy on what could be done in WSAs was made available. Some of the delay in the processing of Fuelco's application relates to changing policy and guidance in the wilderness program.

Congress intended that certain activities which were occurring at the time of passage of the Federal Land Policy and Management Act of October 21, 1976 (FLPMA) continue. A "grandfathered" right for continued development is established by on the ground impacts created in lease holdings prior to the passage of the FLPMA. New impacts may occur in the same manner and degree as have occurred previously.

This means Fuelco's wells, as well as other wells on the south side of the river, can legally be tied together by gathering systems, and additional drilling can occur on any grandfathered leases.

Rights-of-way could be allowed in WSAs if the impacts/use are temporary and the disturbance could be reclaimed to a substantially natural state within four years after approval of the activity. This means that the routes going into or through WSAs would be viable alternatives if the above mentioned criteria is met.

Extensive Gas Development on the South Side of the River

An issue has been raised as to whether or not granting of this proposal would accelerate exploration and development on the south side of the river, thus having a negative impact on potential WSAs prior to wilderness determination and designation. Our findings are that this proposal would probably not accelerate industry activity to any significant degree if granted.

Approximately 50 percent of the land lying in the 500 square miles of potential gas field (in which the oil and gas industry estimates there are an additional 40 wells) is private land. Ten percent is State land and ten percent is managed by the Fish and Wildlife Service. Of the remaining 30 percent managed by BLM, three-fourths lies within proposed WSA boundaries. However, some portions of these WSAs contain leaseholds that have experienced ground-disturbing gas exploration activities prior to October 21, 1976 and could, by the terms of the IMP, be legally developed because of the grandfather clause. Therefore, BLM wilderness study restrictions would prevent development on only 10 to 15 percent of the gas field.

Considering the nation's energy policies, companies will continue to explore and develop known gas fields in an expeditious manner even if distribution lines are not built. Eventually a river crossing would probably be constructed, and the environmental impacts would be of a similar nature to those assessed in this EA. Companies with leaseholds lying on both sides of the river could conceivably construct a pipeline across the river under the grandfathered rights mentioned above. BLM would NOT be the permitting authority. A crossing that would occur to the east of the Stafford Ferry in areas of most anticipated gas findings would have a higher potential for creating more significant negative impacts.

Paddlefish

The Dauphin Rapids, which lie in the path of the company's proposed route (Alternative 1), and just below two other alternative routes, is a known paddlefish spawning ground. This has generated considerable public interest and a number of newspaper articles concerning this issue have been printed. However, the results of the EA show that if construction is undertaken in the fall after spawning, the impact to paddlefish would be negligible.

Soils

The Missouri Breaks, which lie on both sides of the river, contain unstable soil areas which, when disturbed, would be difficult to reclaim. Some sections of two of the alternatives lie on slump areas of recent (probably yearly) activity.

Historic Features

The routes assessed lie within a center of historic and prehistoric activity. Options for management in this locale include nomination of the area as a National Historic District. Some portions of each of the routes would traverse near or through historic sites.

ALTERNATIVES CONSIDERED

Alternative 1 - (Fuelco's Proposed Action) — Crossing is located two miles downstream from the Stafford Ferry.

Alternative 2 - (BLM's Preferred Route) — Crossing is located approximately one mile above the Stafford Ferry.

Alternative 3 — Crossing is at the Stafford Ferry Site.

Alternative 4 — Crossing would be 16 miles upstream from the Stafford Ferry across a new highway bridge proposed to be constructed in the vicinity of the PN Ferry crossing site.

Alternative 5 — Transporting the gas in a southerly direction into Lewistown.

Alternative 6 — Leaving the present situation as is (No Action).

SUMMARY

Alternative One

Fuelco's proposed route (Alternative 1) traverses the Chimney Bend proposed WSA on the south side of the river where steep breaks composed of fragile soils occur. These areas would be very difficult to reclaim to a natural state; therefore, the disturbed areas could not be reclaimed to meet nonimpairment standards. The staging area for the pipeline crossing would be close to an important historic site. Above all, the soils on the north side of the river along this route are extremely unstable. Active slumps (almost yearly) would be crossed by the pipeline route, reclamation would be difficult, and pipeline breakage with associated negative impacts would be anticipated.

Alternative Two

Construction of the preferred route (Alternative 2) would cause least amount of environmental degradation. Less fragile soils and slump areas occur along this line than along Alternative 1 or 3. Historic sites are fewer in number and most can be easily avoided. Where it crosses the Stafford proposed WSA, nonimpairment for wilderness could be met following the strict reclamation procedures listed in this EA. This route lies further upstream from the Dauphin Rapids (and the paddlefish spawning area) than either Alternatives 1 or 3.

Alternative Three

Alternative 3 totally follows the existing county road on both sides of the river and avoids potential WSAs. However, this alternative would run through the same soil slump area mentioned above for Alternative 1. In addition, numerous cultural sites would possibly be disturbed from construction of this alternative, especially at the staging area sites for the crossing.

The difference in construction costs for Alternatives 1, 2, and 3 is a negligable factor when weighed against the value of the gas that would be transported through the pipeline.

Alternative Four

Alternative 4 was initially considered because of other agency and individuals' suggestions plus the newspaper coverage it received. The concept is to transport the gas in a westerly direction to the vicinity of the PN Ferry located 16 miles upstream. The pipeline would then be suspended from a proposed highway bridge. If the area the pipeline traversed from the Leroy Field to the highway bridge was known to have substantial gas reserves and additional wells would be tied into the system, this alternative would deserve further consideration. However, extensive exploration has indicated that no successful wells will be found in this area.

Alternative Five

Transporting the gas into Lewistown (Alternative 5) would alleviate negative impacts associated with the river crossing but would create additional impacts on the much longer route into the city. It would add significantly to the cost of the project and would be uneconomical for the company to construct. Most importantly, Lewistown receives gas from a larger distribution

system entering from the south. Transporting gas from the Leroy Field into the city would only be putting gas into the wrong end of this system.

Alternative Six

Not acting on or deferring a decision on Fuelco's application is Alternative 6. Deferment until the entire gas field on the south side was explored and developed would probably not be to the public's advantage as crossing the river at any point near the gas field would create similar or perhaps even more serious negative impacts.

SIGNIFICANCE OF IMPACT

Study of this proposal indicates that the potential for impacts to the environment from an eight-inch natural gas distribution pipeline crossing the Missouri River and the gathering system do not represent a major federal action warranting the preparation of an environmental impact statement. The level of public interest in this proposal also indicates that an EIS is not required.

IN CONCLUSION

Alternatives 4 — (PN Highway Bridge) and 5 — (transporting the gas into Lewistown) are not viable choices and will not be considered further as options.

The following alternatives are considered to be decision options and could be chosen as the final decision for the proposal.

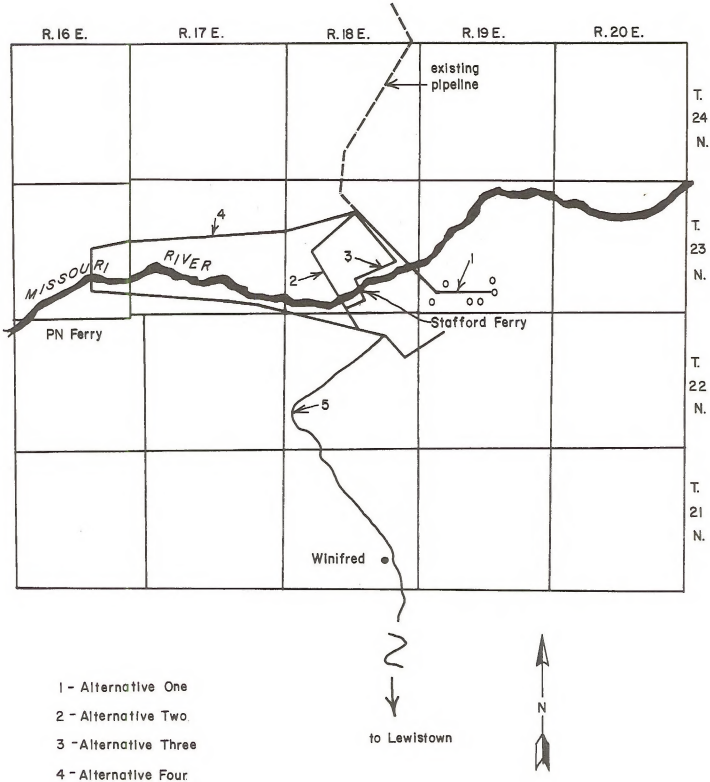
Alternative 1 — (Fuelco's proposed route) could be approved after September 30, 1980, if the Chimney Bend WSA is determined not to be of wilderness quality and is released from further consideration. If this potential WSA remains in the wilderness program, Alternative 1 is not a viable alternative as nonimpairment reclamation would be impossible to accomplish. In other words, the disturbed area could not be reclaimed to a natural state within four years after the project was approved. However, there is one remaining possiblity that this route could be granted, and that is if Congress does not approve this area for wilderness. Congress could make that choice any time before 1993.

Alternative 2 — (Preferred Route) could be approved immediately as reclamation to meet nonimpairment for wilderness could be accomplished. Also, less negative environmental impacts would occur along this route than along any other alternative.

Alternative 3 — Which totally follows the county road on both sides of the river, could be approved immediately as it crosses no proposed WSAs.

Alternative 6 — A final option, would be to deny all crossings or to delay a decision until more complete exploration on the south side of the river has occurred, construction of the whole south side gas field designed, and the potential WSAs designated as wilderness or nonwilderness.

One of these options will be selected as the final decision following a thirty-day public review. The option chosen will be identified in a decision/rationale document and distributed to the public.



1 - Alternative One

2 - Alternative Two

3 - Alternative Three

4 - Alternative Four

5 - Alternative Five

o - Existing Wells

Figure A. All Alternative routes.

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CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

PURPOSE AND NEED

Extensive natural gas development has occurred north of the Missouri River in Blaine County of Central Montana. The Leroy Field, located in the Bear Paw Mountains, contains a well developed distribution system leading to the city of Great Falls (Figure 1.1). An extension of this field is developing south of the river in Fergus County. As of February 1979, 20 wells have been drilled by Fuel Resources Development Company (Fuelco) of Denver, Colorado. Six of these wells are successful producers.

This company proposes to install facilities to gather gas from the field on the south side of the river and connect these to the distribution system on the north side. Their application calls for a 50 foot right-of-way across certain public lands administered by the Bureau of Land Management. Also necessary to complete the connection would be the construction of an eight-inch pipeline under the river in the general vicinity of the Stafford (McClelland) Ferry (T. 23 N., R. 18 E). This portion of the Missouri River forms part of the National Wild and Scenic Rivers system (Figure 1.2).

The Bureau of Land Management (BLM) has undertaken the compilation of the environmental effects of Fuelco's proposal in this environmental assessment (EA) since BLM administers the public land being crossed as well as managing the Upper Missouri Wild and Scenic River. BLM is acting under provisions of the Federal Land Policy and Management Act (FLPMA) of 1976 and the National Environmental Policy Act (NEPA) of 1969 in making this EA.

As this environmental assessment was begun prior to the publication of the Council of Environmental Quality's (CEQ) final regulations on NEPA (November 28, 1978), this EA follows the older CEQ format.

SETTING

The Upper Missouri Wild and Scenic River, along with the paralleling tablelands and corridor of badlands (known locally as the Missouri Breaks), form the Central Montana region under discussion in the EA. The Wild and Scenic River runs from Fort Benton downstream to the Fred Robinson Bridge, a distance of 149 miles. This portion of the river is bordered on the east by the Charles M. Russell National Wildlife Refuge, and on the north, east, and south by intermingled private and public lands.

Blaine County to the north and Fergus County to the south are divided by this portion of the Missouri River. Both counties are sparsely populated, particularly in the Missouri Breaks. The largest community in the region is Lewistown, 45 miles south of the river.

ISSUES

Wilderness

As many as two potential Wilderness Study Areas (WSAs) could be affected by construction of the distribution pipeline depending on which route would be selected. (For an analysis of the effects each alternative would have on wilderness, see Chapter 4.) The Stafford, Ervin Ridge and Chimney Bend potential WSAs lie in the path of portions of Alternatives 1 and 2. Industry activity, with its attendant construction, might affect wilderness values in these areas.

Because of the "grandfather" clause of the "Interim Management Policy and Guidelines for Lands under Wilderness Review" (IMP) (allowing oil and gas leaseholds worked prior to October 21,1976 to continue to be developed in "logical progression"), the WSA designation does not necessarily preclude construction in these areas. Also, rights-of-way can be granted into or through WSAs regardless of grandfathering if it is determined that disturbed areas can be reclaimed to a substantially natural state within four years of approval. Thus Fuelco could legally build a pipeline across the river connecting their pre-1976 wells as long as the above-mentioned nonimpairment criteria can be met.

Extensive Gas Development

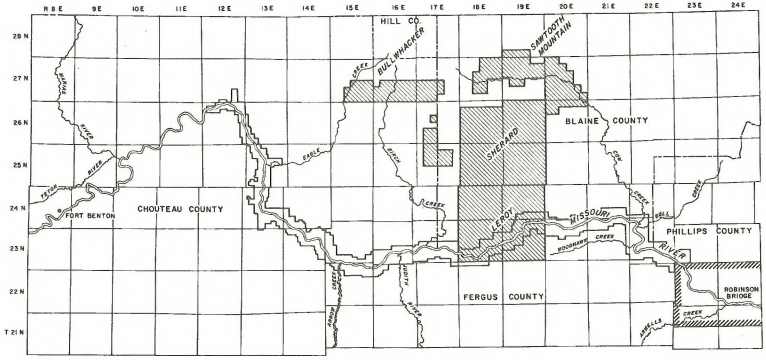
Whether or not granting an alternative route would cause an acceleration in oil and gas development, and thus degrade wilderness values prior to final wilderness designation, is difficult to determine.

BLM manages only thirty percent of the lands encompassed by the 500 square mile gas field on the south side of the river. Of the land managed by BLM, about three-fourths is being considered as potential WSAs, and of this approximately half could not be reserved from oil and gas development because of the grandfather clause in the IMP. Therefore, wilderness designation could prevent development on a maximum of only 10-15 percent of the total gas field.

In addition to the small portion of lands not available to the oil and gas industry on the south side of the river, the need, value, and marketability of natural gas dictate that exploration and development in the area will continue regardless of the decision reached from this study.

Upper Missouri Wild and Scenic River

The National Wild and Scenic Rivers Act (as amended by Public Law 94-486) incorporated the 149-mile segment of the Missouri River from Fort Benton down-



NATURAL GAS PRODUCING FIELDS IN THE VICINITY OF THE UPPER MISSOURI RIVER

SCALE: 1:500,000

Figure 1.1

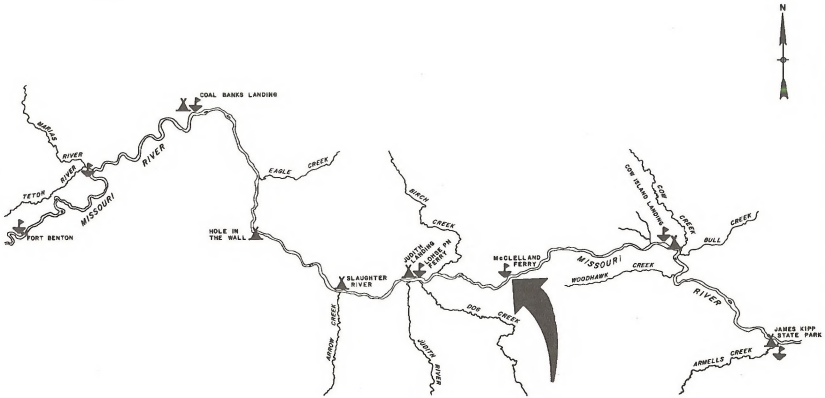


FIGURE 1.2 **UPPER MISSOURI WILD AND SCENIC RIVER**

MONTANA

STATE CAMPSITES

MAJOR RIVER BOAT LAUNCHING POINTS

Scale Of Miles

stream to the Fred Robinson Bridge within the National Wild and Scenic Rivers System.

A management plan for the river was completed (USDI, BLM, 1978). Through this planning process, the following management objectives and policies were developed as related to minerals and land use:

Minerals:

"Allow development and use of mineral resources (as provided in the ACT) in such a manner as to prevent degradation of the aesthetic, prehistoric, historic, geologic, and primitive features of the area, . . ." and that "the removal of gravel or other streambed materials will be permitted only in accordance with existing authorities and where it is determined that such removal will not have a harmful effect upon water quality or fisheries potential."

Land Acquisition and Use:

"Consider issuing easements for rights-of-way, other road permits, trails, a bridge, pumps and water pipelines. Such easements will be issued in order to assure maintenance of present agricultural uses but only when compatible with classification standards and controls of the river segments. Subject to valid existing rights, close all roads and trails which conflict with management objectives."

In addition, a supplemental document (USDI, BLM, 1978) to the "Upper Missouri Wild and Scenic River Management Plan" discusses oil and gas development in this area more fully. It states, "Montana Power and Fuel Resources Development, Inc. are the two most active companies drilling in this area. Fuel Resources was recently issued a certificate to build a gathering system in the Leroy Field by the Federal Power Commission."

"Construction of the system has begun. It will be designed to deliver gas into the northern Montana transmission system. A pipeline corridor across the river may be required to develop those shut-in wells south of the river."

Public Opinion:

Issues pertinent to the management of the river were presented to the public at a series of nine meetings on the river plan held in 1978. One of these issues dealt with the concept of a natural gas pipeline crossing of the river. As stated in the supplemental document, public response to this issue was recorded as follows:

"Industry representatives have proposed a pipeline crossing across the Missouri River. The purpose of the crossing is to link natural gas fields located north and south of the river. There are currently eight producing natural gas wells south of the Missouri River and potential exists for more locations. Do you feel this crossing should be permitted in its present location? At alternative locations? Not permitted?"

"Most individuals agreed that the pipeline should be allowed if construction of the line did not seriously detract from the environmental quality of the area. Many comments were received which stated that the line be of an adequate size to allow for future expansion needs."

Public opinion was also received during the comment period following the publication of the Draft Fuelco EA September 12, 1979. Letters received during this period are included in Chapter 7, along with BLM's responses to them.

AUTHORIZATIONS

It will be necessary for Fuelco to obtain the following permits or concurrences prior to beginning any construction, should a right-of-way be granted.

TABLE 1.1

	Action/Granting Agency	Authority
1)	Riverbed Crossing State of Montana	Natural Streambed and Land Preservation Act (State Statute)
2)	404 River Crossing Permit Corps of Engineers	Clean Water Act Section and River and Harbor Act of 1899 Section 10
3)	County Road use for pipeline right-of-way, County	Fergus and Blaine County concurrence
4)	Pipeline right-of-way, BLM	Section 28 Mineral Leasing Act of 1920 as amended

EXTENT OF ASSESSMENT

BLM has taken the lead in assessing the environmental consequences of Fuelco's proposal as mentioned. Discussion of the scope of this action was undertaken and all reasonable alternatives were explored. Even though Fuelco's application is for a right-of-way across only 2.06 miles of public land, this study considers the possible disturbance to all lands from construction of the main distribution line across the river, as well as from the gathering system required for the six wells. Each oil and gas industry action proposed on the south side in the future must be assessed on its own merits and approved or disapproved depending on the guidance presented in "Interim Management Policy and Guidelines for Lands Under Wilderness Review" (USDI, BLM, Dec. 12, 1979), and also on the degree of negative impacts anticipated on other resources. It was also determined that this EA should not only assess Fuelco's proposed route, but five other alternatives as well. These are listed below (see Figure A in the Option Summary also):

Alternative 1 (Proposed Action) — This would con-

sist of Fuelco's proposed pipeline routing and river crossing site located approximately two miles downstream from the Stafford Ferry.

Alternative 2 (BLM Preferred Action) — This route would include a river crossing site delineated by BLM's assessment team and located approximately one mile upstream from the Stafford Ferry.

Alternative 3 — This would consider a route which includes portions of the Alternative 1 and 2 routes, crossing at the Stafford Ferry site.

Alternative 4 — This route would cross the river approximately 16 miles upstream, in the vicinity of the PN Ferry, across a new highway bridge to be constructed at this point.

Alternative 5 — Distributing the gas on the south side of the river in a southerly direction into Lewistown and points beyond would be an alternative.

Alternative 6 — Leaving the present situation as it is; in other words, taking "No Action", would be the final alternative to consider.

Alternatives 1, 2 and 3 are discussed through all Chapters of this EA. Alternative routes 4 and 5 are discussed only through Chapter 2 because after careful study of all environmental factors, routes 4 and 5 are not considered viable alternatives. A summary of these findings is given in Table 1.2 at the end of this Chapter. Alternative 4 is of no economic advantage to the company and field assessment clearly indicates that the anticipated environmental damage would be much greater here than from Alternatives 1, 2 or 3. Alternative 5 would deliver the gas to Lewistown, an area where it is not needed, and is also the most expensive route to construct. In the case of Alternative 6, "No Action", the principal negative impact is an economic one, and this impact will be discussed in the next chapter.

The scope of the assessment of this proposed action includes determining the disturbances resulting from a point of previous construction on the north side of the river to a gathering point on the south side, disturbances to the river at the crossing site, and a general assessment of the anticipated impacts of connecting the six wells.

TABLE 1.2 MATRIX COMPARING LEVELS OF IMPACTS BY ENVIRONMENTAL COMPONENT FOR THE ALTERNATIVES 1 - 5.

ANIMALS	PREHISTORIC & HISTORIC FEATURES	AESTHETICS	RECREATION	WILDERNESS	SOCIAL & ECONOMIC CONDITIONS	LAND USE
1. Degree of impact would be directly proportional to development of service roads. 2. N.A. 3. Greater	1. Significant long term impact. 2. N.A. 3. Greater	1. VRM impact critical short term, long term if rehabilitative measures fail; route crosses VRM Cl I in scenic segment; unavoidable adverse visual impacts to be created. 2. N.A. 3. Greater	1. Significant impact in short term due to construction. 2. N.A. 3. Greater	1. Ervin Ridge is minimally involved. Chimney Bend is massively impacted-western 1/3 of unit could be disqualified for future study. 2. N.A. 3. Greater	1. Moderate short term adverse impact to Winifred population. Moderate short term increase in income. Slight long term increase in property & severence taxes. 2. N.A. 3. Proposal costs less .	1. Insignificant short term impact to livestock & transport. 2. N.A. 3. Similar
1. Less road development would be necessary, thus, less impact on wildlife. 2. Lesser 3. N.A.	1. Insignificant in long term. 2. Lesser 3. N.A.	1. VRM impact significant in short term. 2. Lesser 3. N.A.	1. Significant impact in short term; insignificant if mitigation successful. 2. Lesser 3. N.A.	1. Chimney Bend Unit impacted principally by gathering lines - not the main line. The Stafford Unit would be bisected by the main line. 2. Lesser 3. N.A.	1. Similar to above. 2. Alternate 2 construction costs are $529,000 greater. 3. N.A.	1. Insignificant short term impact to livestock; significant to transportation because of use of county road. 2. Similar (livestock) Greater (transportation) 3. N.A.
1. Insignificant short term impact as existing roads are used for R/W. 2. Lesser 3. Similar	1. Critical due to numerous sites N. of river on this route. 2. Greater 3. Greater	1. VRM impact critical short term, potentially long term, due to length; unavoidable impacts probable. 2. Similar 3. Greater	1. Significant impact in short term, potentially greater impact in long term as route parallels main access road across river. 2. Similar 3. Greater	1. Since this combination of routings mainly follows existing roadways there is less impact to wilderness. 2. Lesser 3. Lesser	1. Similar to above 2. Alternate 3 would cost $670,000 more. Greater maintenance costs because more pipe in the Breaks. 3. Alternate 3 would cost $142,000 more & would entail greater maintenance costs.	1. Insignificant short term impact to livestock; significant to transportation because of use of county road. 2. Similar (livestock) Greater (transportation) 3. Same as #2.
1. Significant long term impact on winter range of 250-300 mule deer and sage grouse wintering area. 2. Greater 3. Greater	1. Critical due to numerous sites on Whiskey Ridge & because of impact to Judith Landing 2. Greater 3. Greater	1. VRM critical short term; potentially long term, as line runs through great acreage of Cl I & Cl II; unavoidable adverse visual impact probable. 2. Similar 3. Greater	1. Insignificant in short term. 2. Similar 3. Greater	1. Highly erodable terrain would mean extensive scarring in the Dog Creek Unit. 2. Somewhat more impact. 3. More impact	1. Similar to above 2. Alternate 4 costs are nearly $1 million more. Greater maintenance cost. Impacts to Winifred greater - longer construction time. 3. Alternate 4 construction more.	1. Significant short term impact to livestock, insignificant to transport. 2. Greater (livestock) Lesser (transport) 3. Same as #2.
1. Significant long term impact as route crosses winter range of 300-350 mule deer & is yearly habitat of 250-300 antelope, several sage grouse breeding grounds & important pheasant & "hun" habitat. 2. Greater 3. Greater	1. Insignificant due to use of barrow pits along roads. 2. Lesser 3. Lesser	1. VRM significant in short term; route crosses proposed Nez Perce National Historical Trail. 2. Similar 3. Similar	1. Insignificant impact in short term. 2. Similar 3. Similar	1. Main line construction would not effect wilderness. Impact from gathering lines minimized by using existing trails. 2. Lesser 3. Lesser	1. Similar to above 2. Alternate 5 costs are nearly $2 million more; impact to Winifred greater. 3. Alternate 5 costs are nearly $1.5 million more; impact to Winifred greater.	1. Insignificant short term impact to livestock, significant short term impact to transport. 2. Similar (livestock) Greater (transport) 3. Similar

	CLIMATE & AIR QUALITY	GEOLOGY	TOPO-GRAPHY	SOILS	WATER	VEGETATION	FISH
ALTERNATIVE 1 Pueblo's (Proposed Route)	1. Minimal short term impact to air quality during construction. Degree of impact is directly related to length of pipeline. 2. N.A. 3. Similar	1. Impact would be slightly positive due to discovery of paleontological information. Degree of impact to length of disturbance. 2. N.A. 3. Similar	1. No measurable impact to this component.	1. Predominately clayey, strongly sloping to steep on dissected shale plains & steep on highly dissected river breaks. Extreme impacts because of location on highly unstable soils. 2. N.A. 3. Greater	1. Moderate impact due to river crossing plus 4 intermittent stream crossings. 2. N.A. 3. Greater	1. 80% of route significant short term because of steep slopes & low productivity of soils; long term impact if revegetation fails. 2. N.A. 3. Greater	1. Significant to critical short term impact to paddlefish, blue sucker migration & to all species from possible gas leaks. 2. N.A. 3. Greater
ALTERNATIVE 2 8 MILES	1. Same as above 2. Similar 3. N.A.	1. Same as above 2. Similar 3. N.A.	1. Same as above	1. Same as along proposed route except a significant segment of pipeline is on soils of nearly level to moderately steep sedimentary plains. Soils are more stable than along proposed. 2. Lesser 3. N.A.	1. Moderate impact due to river crossing plus 5 intermittent stream crossings. 2. Lesser 3. N.A.	1. 3½ miles significant in short term; long term impact possible if revegetation fails. 2. Lesser 3. N.A.	1. Significant short term impact-potentially long term because of sediment, blasting may stop upstream migration. 2. Slightly less to similar 3. N.A.
ALTERNATIVE 3 8-11 MILES (depending on exact route)	1. Same as above 2. Similar 3. Similar	1. Same as above 2. Similar 3. Similar	1. Same as above	1. Same as along proposed route 2. Slightly less 3. Greater	1. Moderate impact; river crossing plus 3 intermittent streams. 2. Slightly less 3. Greater	1. 4½ miles significant in short term due to steep slopes, low productivity soils; long term impact if revegetation fails. 2. Greater 3. Greater	1. Potentially significant due to close proximity of pipeline to river which could add sediment; danger of wash-outs during floods. 2. Similar 3. Similar
ALTERNATIVE 4 + 25 MILES	1. Same as above 2. Greater 3. Greater	1. Same as above 2. Greater positive impact 3. Greater positive impact	1. Same as above	1. Generally similar to proposed route except more pipeline would be on Badlands, soils and highly dissected river breaks. 2. Greater 3. Greater	1. High impact crosses river plus 2 major perennial streams & 5 intermittent streams. 2. Greater 3. Greater	1. 4 miles significant in short term because of steep slopes, poor soil; potential long term if revegetation fails. 2. Greater 3. Greater	1. Insignificant although increased length of pipeline could lead to increased sediment runoff. 2. Lesser 3. Lesser
ALTERNATIVE 5 + 45 MILES	1. Same as above 2. Greater 3. Greater	1. Same as above 2. Greatest positive impact 3. Greatest positive impact	1. Same as above	1. Most of route would follow previously disturbed soils within existing road right-of-ways. These are clayey soils on sedimentary bedrock plains. 2. Lesser 3. Similar	1. Impacts on water would be high due to the greater number of stream crossings; 3 perennial & 32-40 intermittent. 2. Greater 3. Greater	1. Insignificant short term impact. 2. Greater 3. Greater	1. Insignificant to significant short term impact with potentially long term impact due to pipeline crossing small streams. 2. Lesser 3. Lesser

LEGEND

(1) Degree and Term of Impact
(2) Comparison to Impact of Alternative 1
(3) Comparison to Impact of Alternative 2

CHAPTER 2

ALTERNATIVES

CHAPTER 2

ALTERNATIVES

ALTERNATIVE 1 (Proposed Action)

Fuelco's application is for a right-of-way 50 feet in width and approximately 2.06 miles in length through public lands located in Section 19, T. 23 N., R. 19 E., and Sections 13, 14, and 24, T. 23 N., R. 18 E., in Blaine County (Figure 2.1).

The primary purpose of the proposed right-of-way is to enable Fuelco to construct a pipeline to hook up gas wells south of the Missouri River in the Leroy Natural Gas Field to a distribution system on the river's north side. Fuelco has drilled, tested, and shut-in 6 natural gas wells with estimated gross reserves of 2,160,000 MCF (thousand cubic feet.). In addition to the Fuelco wells, two wells drilled in the immediate area by another company have estimated gross reserves of 326,000 MCF.

The applicant proposes to drill additional wells which would use the proposed pipeline. In the Leroy Field south of the river, it is estimated that from 4 to 6 producing wells could be developed.

Outside of the Leroy Field and within a twenty-mile corridor of the river from the PN Ferry east to the Fred Robinson Bridge (an area of 500 square miles), Fuelco estimates that 35 to 40 successful wells might be drilled by the oil and gas industry, resulting in roughly 10 to 16 recoverable BCF (billion cubic feet).

The applicant requests that the right-of-way be granted for a term of 30 years with the right of renewal upon expiration. The applicant agrees to operate the facilities as a common carrier. There are no plans to later increase the throughput capacity of the proposed pipeline or to build another pipeline across the river. The proposed crossing would utilize eight-inch pipe which would accommodate all anticipated future increases in throughput capacity. One and one-half miles of eight-inch pipe would be necessary to traverse from rim to rim across the river canyon.

In addition to the 8 inch pipe, the length of "dryland" pipeline needed in the point-to-point construction described, plus connections of the 6 wells already drilled, is approximately 15.5 miles. This consists of 9 miles of 6 inch pipe and 6.5 miles of 2 inch pipe. The proposed easement would provide for a 50 foot right-of-way involving approximately 6 acres per mile of right-of-way.

The river crossing would be constructed during the low water period after the receipt of the necessary permits and approval of the right-of-way easement by the Bureau of Land Management.

Stages of implementation involving discrete operations are described below.(BLM Lewistown District Office Oil and Gas Programmatic EAR, MT-060-06-9-4, discusses these operations in greater detail.)

Dryland Installation:

A. Survey Implementation State

This stage would require vehicular travel (4-wheel drive) along the right-of-way (R/W) and adjacent areas for the purposes of cultural resource inventories and engineering activities such as surveying.

B. Right-of-Way Clearing

1. Site Preparation

This operation, where required within the R/W, would involve the removal of sod, rocks, trees, and leveling in advance of the trenching operation. Site preparation might be extensive in the Breaks area. Rocks and trees that restrict travel on the R/W would be removed and windrowed to the inside of the R/W. R/W clearing would be done with bulldozers of varying sizes and with road graders.

C. Construction

1. Fencing

New gates and supporting fences would be constructed where existing fences intersect the R/W. Gates would be removed and fences reconstructed upon completion. The equipment needed includes truck and tractor-mounted augers.

2. Delivery-Unloading and Stringing Pipe

The delivery, unloading and stringing together of pipe along the R/W is included in this operation. The pipe would be hauled by tractor-trailer trucks. Some areas outside the R/W might be affected by the unloading operation. These areas would be along the steep slopes where turn around space would be restricted. Offsite damage might occur on access routes to the R/W from other than county roads and private trails. Some cross-country travel could be anticipated in areas of limited access.

3. Ditching

This operation would involve excavation of a trench with a maximum width of 24 inches and minimum depth of 42 inches. Excavation might be made by ditchers, backhoes, rippers, explosives, or by combinations of equipment. Spoil would be placed on side of the trench within the limits of the R/W.

4. Public Road Crossing

This process would include boring through the road bed, installing casing, and stringing pipe through the bore hole. An area large enough to set the boring machine would be cut to grade and leveled.

5. Bending

The line pipe would need to be bent both vertically and horizontally to conform to the terrain. Pipe is

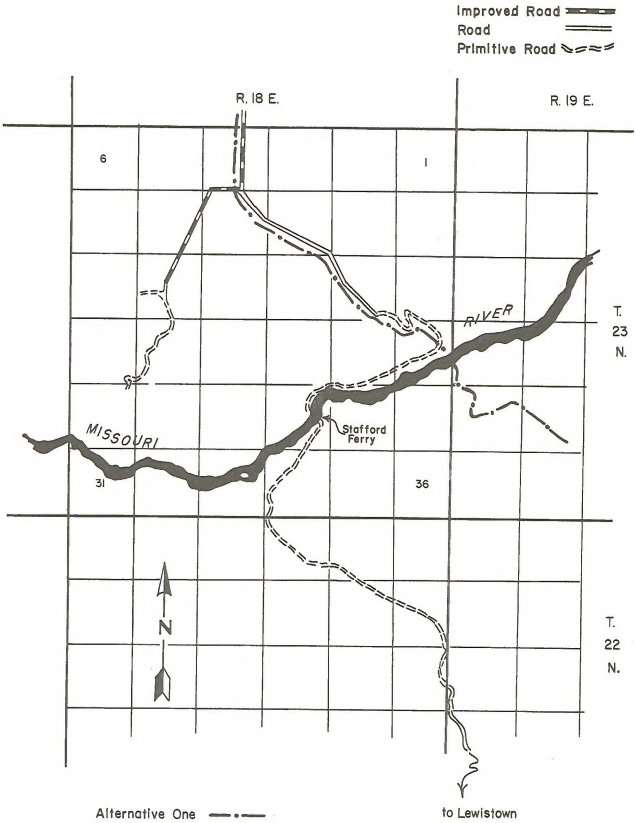


Figure 2.1 Alternative One proposed route. The crossing would be two miles below the Stafford Ferry.

bent by placing individual lengths in bending machines. The bending machines would travel within the limits of the R/W.

6. Welding

This operation would involve the use of mobile welding equipment to join the pipe sections. Welding would be done on the R/W by metal arc or CO2 metal arc process. Pipe would be lowered onto skids by side-boom tractors after the initial welding process.

7. Protective Pipe Coating

The pipe and fittings would be coated in the field with coal tar enamel or pressure-sensitive polyethylene plastic tape as a protective external coating in this operation. The coating would be done with special coating equipment and confined within the limits of the R/W.

8. Lowering In

This would involve the lowering of the fabricated and coated pipe into the ditch, generally by tractors with side mounted booms. The pipe would be welded on top and pulled down by winch from the bottom where the grade was too steep for conventional pipe placement equipment to operate along the ditch.

9. Backfilling

Backfilling would be replacing the excavated material into the ditchand compacting as required. Excess spoil would be crowned up over the trench sufficiently so that normal settlement would not create a depression in the trench line. Motor graders, angle dozers, and auger backfillers might be used to move the dirt from the spoil bank to the ditch.

10. Pigging

This would be the use of pipe cleaning equipment to insure that the inside of the pipe is free from any obstructions before valve connections are made. Various types of equipment are used in this process and might include backhoes, bulldozers and patrols, depending upon the problems encountered. The equipment used would be confined to the area within the R/W.

11. Testing

Testing would involve the use of a gas or water to pressure test the newly constructed pipeline. The hydrostatic test pressure would be maintained for a period of 24 hours. The equipment that might be used includes backhoes, bulldozers, welders or tanker trucks.

12. Cleanup

Cleanup of all construction debris, defective material, rocks, and stumps would follow the testing process. Construction materials and debris might be burned in sanitary landfills, with rocks and stumps buried in the R/W, or in other designated areas.

13. Rehabilitation

This operation would include reshaping the land to natural contours and reseeding the distrubed areas. Slope areas might require terracing and the construction of water bars to control water flow. The disturbed areas would include the trenched area of the R/W and access roads.

D. Operational Procedure

1. Inspection of Systems and Facilities

This would involve the periodic patrol of the R/W, equipment surveillance, inspection of valves and metering devices, monitoring of cathodic protection devices, etc. Inspections might be on a weekly basis with travel on and off the R/W. All-weather roads would be required to inspect the main valves and monitoring stations.

E. Maintenance Procedures

1. Facilities Repair

These procedures would include the repair of pipeline leaks, repair, or replacement of parts in metering stations, etc. A major pipeline repair could require the operations of excavation, welding, backfilling, and cleanup. The equipment that might be used includes: backhoes, welders, patrols, tractor trailers, side-boom bulldozers, or 4-wheel drive vehicles. Repairs are generally confined to the R/W area.

Missouri River Crossing:

A. Right-of-way Clearing

1. Staging Areas

This operation would involve the removal of sod, brush, rocks, trees, and leveling the area for storage of pipe and the construction equipment required to construct the river crossing. The leveled areas might exceed five acres in size. Equipment used for the clearing operation might include patrols, scrapers, and bulldozers.

B. Construction

1. Unloading Pipe

(See Item No. C.2 under Dryland Installation).

2. Ditching

This operation would involve the excavation of a trench beginning on the river bank, traversing

underneath the Missouri River and exiting on the opposite bank. The trench under the river would be approximately 3 feet wide, 6 feet deep and 810 feet long. The ditch excavation might be made by bulldozers, backhoes, dredges, draglines, explosives, or combinations of this equipment.

Material from the trench would be deposited in the waterway, and/or on the bank. Approximately 100 feet on either bank would be excavated to grade to conform to the bottom grade underneath the river. The equipment used includes bulldozers and backhoes.

3. Welding

This process would involve the use of welding equipment to join the pipe sections as described above. The welding would be done in the staging area and the entire crossing segment fabricated into one complete section. Welding would be metal arc or CO2 metal arc process.

4. Protection Pipe Coating

This would be the coating of the pipe and fittings in the field with coal tar enamel or pressure-sensitive polyethylene plastic tape as a protective external coating. Work would be done with special coating equipment and in the staging area.

5. Lowering In

This would be putting in place the underwater prefabricated portion of the pipeline. The equipment used would be bulldozers and heavy winch vehicles. Precast concrete weights would hold the pipe in place. The installation would occur during the period of low water.

6. Backfilling

Excavated material would be placed into the ditch and compacted as required. The trench would be backfilled using causeway or work platform material.

7. Pigging

This would be the use of pipe cleaning equipment to insure that the inside of the pipe is free of any obstructions as mentioned above. Pigging would be completed in the staging area before the pipe is put in the trench.

8. Testing

(See Item No. C.11 under Dryland Installation).

Pressure testing would be done in the staging area prior to putting the pipe into the trench.

9. Cleanup

(See Item no. C.12 under Dryland Installation).

Construction debris and defective material would be buried in sanitary landfills and the rocks buried in the R/W.

10. Rehabilitation

The stream banks would be reshaped to natural contours and the disturbed areas would be reseeded. The disturbed areas could include the staging area, the R/W, and the stream banks at the crossing.

Estimated life of this project is in excess of 15 years.

ALTERNATIVE 2

During BLM's field investigation of Fuelco's proposal, a location for a river crossing was discovered that appeared to be more environmentally suitable than the other sites (Figure 2.2).

Total new disturbance to lands would be from an existing pipeline located on the north side of the river to the north bank of the river. After crossing the river, the pipeline would cross an alfalfa field to the county road and follow the county road to a place where the gathering system would meet the main line.

Fuelco has indicated that the following amounts of pipe would have to be laid to complete the connection (including gathering system): 2.5 miles of 8 inch pipe at the river crossing site, 19 miles of 6 inch pipe, and 9.3 miles of 2 inch pipe. This would amount to about 14 more miles of pipe than the proposed route, at an additional cost of $500,000. This figure is 57% above the cost of the proposal ($924,300). Fuelco's proven reserves are valued at about $4,400,000 and probable reserves at $3,100,000, a total of $7,500,000. (These values were derived by multiplying the estimated proven and probable reserves figures by the 1980 figure of $2.05 per cu. ft. provided by Thomas O'Neill of Montana Power Company). Thus the portion of the reserve values expended for construction would increase from 12% for Alternative 1 to 19% for Alternative 2.

The discrete operations involved are the same as those discussed under the Proposed Action.

ALTERNATIVE 3

This alternative includes portions of both Alternative 1 and Alternative 2 to reach a river crossing site at the Stafford Ferry (Figure 2.3 and 2.4).

Only those portions of the route which are not inherent in the Alternative 1 or Alternative 2 routes are assessed for impacts in the remainder of this document, beginning at a point where the Proposed Route leaves the county road on the north side of the river to where Alternative 2 joins the county road on the south side of the river.

The following amounts of pipe would have to be laid to complete the connection (including gathering system): 5.5 miles of 8 inch pipe, 19 miles of 6 inch pipe, and 9.3 miles of 2 inch pipe. This would amount to

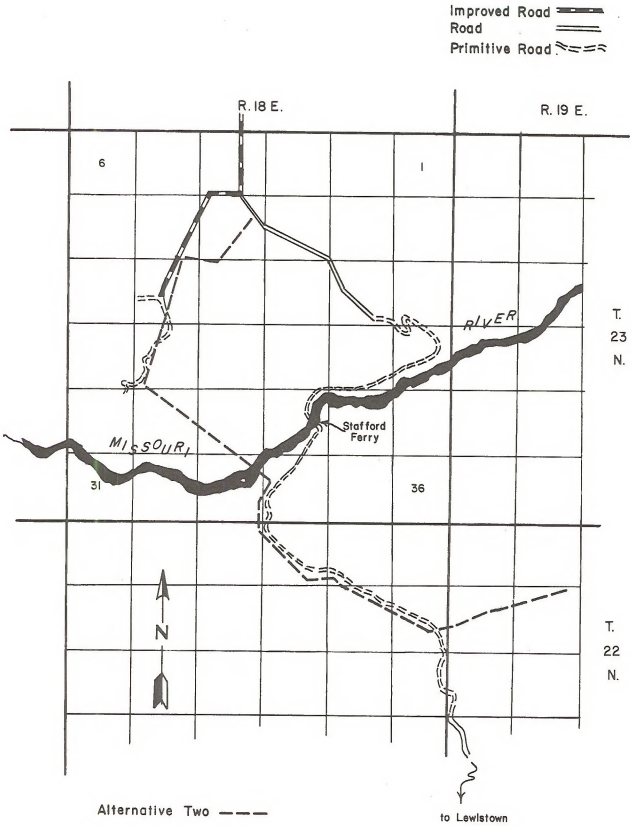


Figure 2.2 The Alternative Two route which would cross one mile above the Stafford Ferry.

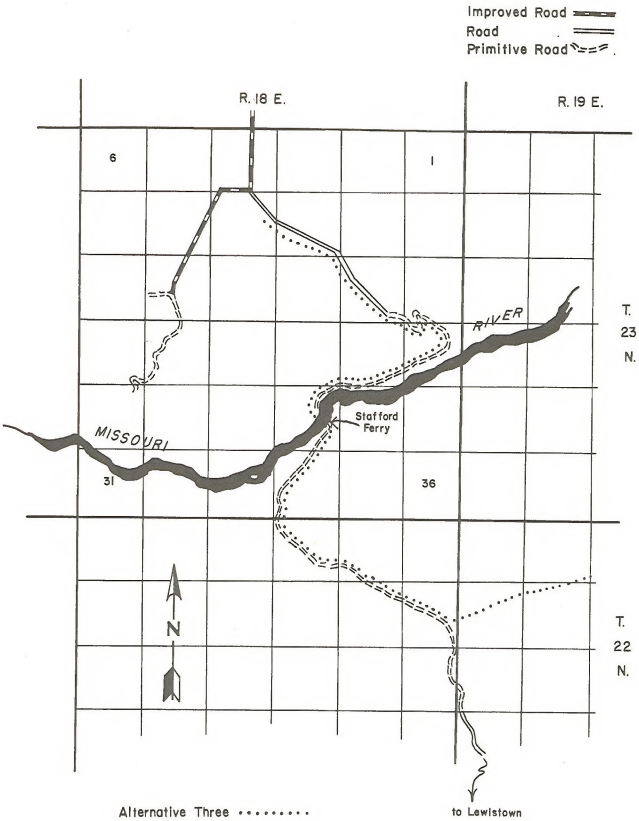


Figure 2.3 Alternative Three route which would cross at the Stafford Ferry.

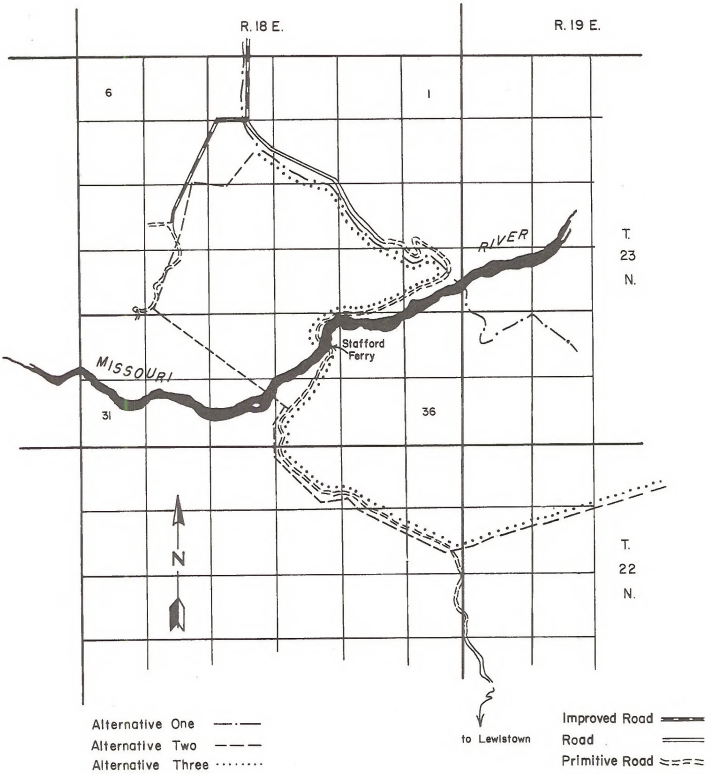


Figure 2.4 All alternatives which would cross in the Stafford Ferry area.

about 17 more miles of pipeline than under Alternative 1 at an additional cost of $670,000 and 3 more miles of pipeline than under Alternate 2 at an additional cost of $142,000. The portion of the fuel reserve values expended for construction would be 12%, 19%, and 21% for Alternatives 1, 2, and 3, respectively.

The discrete operations involved are the same as those discussed under the Proposed Action.

ALTERNATIVE 4

This alternative considers suspension of the pipeline from a proposed highway bridge to be constructed in the vicinity of the PN Ferry (Figure A). This location lies approximately 16 miles upstream from the location of Alternative 1 (Stafford Ferry area).

The following amounts of pipe would have to be laid to complete the connection (including gathering system): 32 miles of 6 inch pipe and 9.3 miles of 2 inch pipe. This would amount to 24 more miles of pipeline than under Alternative 1 at an additional cost of nearly $1,000,000, and 10 more miles of pipeline than under Alternative 2 at an additional cost of $420,000. The portion of fuel reserve values expended for construction would be 12% for Alternative 1 and 25% for Alternative 4. Under this alternative, maintenance problems and expenses would probably increase because of increased pipeline in the Breaks area.

This route, however, would appear to be a viable alternative route if extensive gas development resulted in the discovery of a substantial number of producing wells between the Stafford and the PN Ferry. This seems highly unlikely as the area west and south of the Leroy Field has experienced a high density of drilling (47 wells) with no economic successes. The area east of the Leroy Field to the Fred Robinson Bridge, (downstream from the Stafford Ferry) is relatively unexplored and presents the most likely area for significant discoveries. At the present time, therefore, it seems unreasonable to consider a pipeline crossing as far upstream as the PN Ferry, and this alternative is hereby dropped from further discussion.

ALTERNATIVE 5

Alternative 5 involves distributing the gas from the south side of the river in a southerly direction into Lewistown (Figure A).

The following amounts of pipe would have to be laid to complete the connection (including gathering system): 57 miles of 6 inch pipe and 9.3 miles of 10 inch pipe. This would amount to 49 more miles of pipeline than under Alternative 1 at an additional cost of nearly $2,000,000 and 35 more miles of pipeline than under Alternative 2 at an additional cost of $1,500,000. The portion of fuel reserve values expended for construction would be 12% for Alternative 1 and 39% for Alternative 5.

The Montana Power Company states that the market for the gas is not in Lewistown but in the Great Falls area. Assuming the completion of the gas line from the Big Coulee Field south of Ryegate to the main distribution line, Lewistown should have an adequate supply for the future. The reason for tying the line in to the north rather than the south is to connect it into the main Montana Power line (see EAR-MT-060-06-9-4, Appendix Figure 1-1). Construction to the south would only tie the line into the "wrong" end of the Lewistown spur.

ALTERNATIVE 6

Denying Fuelco's application at this time would probably not result in any future protection of the river or the fragile Breaks ecosystem. Gas development on the south side may slow down but would not entirely cease. Eventually the gas would have to be distributed to meet the energy needs of Great Falls' citizens and others linked to the north side distribution system, since the gas is not needed in a southerly direction.

The direct economic and social impact of this alternative is the loss of the natural gas until a new field development plan could be drafted. The proven reserves of the eight wells on the south side is 2,486,000 MCF. In addition, the probable and possible reserves are another 3,000,000 MCF.

One million MCF is enough to run about 700 households for 10 years. Thus the proven reserves could heat a town of 1,600 households (5,000 people) for ten years and the probable and possible reserves could add an additional 2,000 households for a decade.

If the river is crossed at any point, similar serious negative environmental impacts as those previously discussed could be anticipated. To cross downstream from the present proposed site would involve crossing a "Wild" section of the river. Further downstream from the "Wild" section would involve crossing in the Charles M. Russell Wildlife Refuge, unless the pipeline was attached to the Fred Robinson Bridge. To cross the river upstream from Alternative 1 would involve construction of many extra miles of pipeline through the fragile Missouri Breaks ecosystem. Thus, it appears that crossing the sites near the Stafford Ferry are probably as well or better conceived than any of the others which have been made or might be proposed in the future.

Hereafter, only Alternatives 1, 2, and 3 will be discussed in the chapters to follow.

CHAPTER 3

DESCRIPTION OF THE ENVIRONMENT

CHAPTER 3

DESCRIPTION OF THE ENVIRONMENT

CLIMATE AND AIR QUALITY

The climate along the Missouri River in Central Montana is marked by extremes of climatic variables. Large scale fluctuations of temperature and humidity can be diurnal as well as seasonal. The complex topographic system of coulees, buttes, and ridges in the area has a pronounced influence on the aerial distribution of precipitation, wind, and the stability of the air. Annual precipitation is roughly classified as semiarid although approximately seven inches of the yearly total of 13.5 inches falls during the months of May, June and July alone.

This climate is well within the limits of the modified continental type although some characteristics, such as the occurrence of warm westerly winds (chinooks), tend to moderate the mean temperature so that conditions are warmer than usual for this latitude. The warm winds are more pronounced in the western portions of the area. In the winter, cold waves frequently associated with snow and below-zero temperatures occur five to ten times each season. These cold spells seldom last more than five days at a time, but can produce minimums in the -20° F to -40° F range. Summers are pleasant with average afternoon maximums of approximately 90° F and comfortable nighttime minimums during July of 56° F. The growing season lasts approximately 120 days.

The influence of precipitation upon the production of forage is maximized by the large amount of rainfall which occurs in the first half of the growing season. Showers and steady rains occur extensively over the area during the late spring. In the summer, precipitation is poorly distributed over time and area and is occasionally associated with heavy late afternoon and evening thunderstorms, accompanied by strong hail locally. Late summer and fall storms frequently result in light showers followed by wind and/or bright sunshine. Winter is characteristically the driest part of the year, with a total of 40 inches of snow occurring over the average season. The greatest average monthly snowfall occurs during March. Vegetation suffers from recurrent periods of drought which occur in Central Montana about once every ten years.

Evaporation has a variable distribution over time and area. On north facing canyon walls which receive less of the sun's direct solar radiation and on concave topographic positions protected from the windy plains, evaporation of water from the land surface as well as transpiration of water from vegetation is reduced. The soil is capable of retaining enough water to allow for the growth of pine trees in these areas.

Air quality in the general area is excellent, principally due to the lack of industry and residences. There is evidence of an air inversion along the bottoms of the Missouri River during winter months. As the nighttime air cools, it tends to move downslope into the canyon bottoms where, because of stable circulation at certain periods of the winter, it becomes trapped. Air warmed by the daytime sun on the surrounding plains may move over the trapped layer inducing the inversion.

Tables presenting climatic data in detail are contained in Appendix Table 1. The Iliad station is located upstream and the Mobridge station is located downstream from the Alternative 1 crossing site approximately 20 and 30 miles, respectively.

GEOLOGY

Rock strata in the area are assigned to three Upper Cretaceous Formations - the Claggett (the oldest), Judith River, and Bearpaw.

The Claggett Formation in this area is composed of dark marine shales with sandstone mixed in (the sandstone being more prevalent in the upper half). The lower shales may contain calcareous concretions. These are fossiliferous, with an invertebrate fauna which includes Baculites, Modiola, Scaphites, and Inoceramus (pelecypods and ammonites). The formation is about 400 feet thick.

The Claggett is conformably overlain by the Judith River Formation. Here it consists of alternating beds of fresh-to-brackish water shale, sandstone and lignite. The rocks are soft and tend to weather into badlands topography. The formation may be more than 500 feet thick.

The Bearpaw Formation conformably overlies the Judith River. It predominately consists of dark marine shales with numerous calcareous concretions locally. It weathers into soft rounded slopes and may exceed 750 feet in thickness.

These rocks preserve a complete cycle of the environments of deposition. The Claggett was deposited under marine conditions, with the sediments becoming more brackish toward the top. The overlying Judith River beds were deposited in brackish-to-fresh water conditions as continental sediments filled in the marine basin. The Bearpaw Shale represents the last marine incursion into the area, as a shallow-water open sea covered the midwest again.

These shale units give rise to the Cabbart, Ethridge, Marmarth, Thebo, and other soils, and are discussed under the "Soils" Section.

Fossils found in these formations reflect their environments. The sediments of the Claggett and Bearpaw may contain many species of marine invertebrates, such as Baculites, Scaphites (ammonites), Inoceramus, Modiola, and Lucina (palecypods). They also may contain several types of marine reptiles, such as Plesiosaurus or Monossaurus.

The Judith River sediments are of continental origin as mentioned above. Representative fossil genera of invertebrates include Mytilus, Goniobasis, and Ostrea (pelecypods and gastropods). Large oyster beds developed which became several feet thick and covered an extensive area.

Plant fossils which can be found include petrified wood, seeds or cones, and leaves from oak (Quercus), maple (Acer), poplar (Populus), and sequoia (Sequoia).

Vertebrate remains include the reptiles Trachodon, Ornithomimus, Ceratops, and Hadrosauras, the fish Lepidotus and Ceratodus, and a turtle Trionyx.

Faulting of the strata is common in this area. These faults are of the high-angle reverse type which may become a bedding plane fault with depth. Disruption of the bedding is common, causing certain horizons to be repeated several times within a short distance.

The attitude of the bedding is extremely variable due to faulting and the softness of the bedding. Bentonite can be found at several horizons in all three formations with beds averaging less than 18 inches in thickness. This, coupled with overburden which ranges from 50 - 100 feet above the bentonite, makes these beds uneconomical to mine at present.

Lignite beds in the Judith River Formation (one in the are being considered) have been mined in the past. The bed averages no more than 2 1/2 feet thick, and was mined mainly for local use.

There are several gas fields in the general area (Figure 1.1). The reservoir beds (permeable sandstones) were thrust up by faulting against impermeable shales, forming a structural trap where gas may be trapped (Figure3.l).

A possible geologic hazard common to this area is "mass movement" in the form of landslides or slumps. (See the "Soils" Section.) These are natural events which usually occur when strongly sloping, incompetent sediments have been oversteepened (such as by the undercutting of a meandering stream). Mass movement may also occur when a mass too large for the incompetent sediments to support is added to the upper slopes. Large amounts of material may slide down slope with the movement being either gradual or abrupt. The movement can break or bury roads and other linear features by removing their support.

TOPOGRAPHY

The terrain in the area varies from the low, rolling hills in the uplands away from the Breaks to the steep, incised slopes in the Breaks and side drainages. The drainage pattern is dendritic and the valley walls rise abruptly above the narrow floodplain.

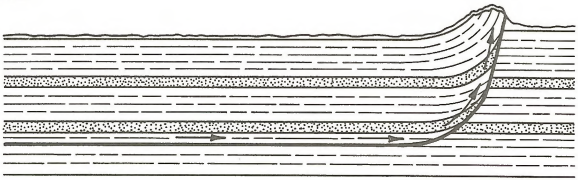
Local elevation extremes range from about 2,350 feet along the Missouri River to more than 3,500 feet at Lone Tree Bench eight miles north of the river.

The terrain along Alternative 1 is hummocky (more from slumping than drainage) with this pattern continuing south across the river. There is little vegetation to impede erosion. Alternative 2 crosses the Bearpaw shale through the fault zone; potential for slumping exists here although there are more stable soils on this route than on Alternative 1. The fault zone also creates resistant ledges of the exposed sandstone and the steep slopes of the Bearpaw Formation.

SOILS

Soils along the Alternative 1 route are highly variable within short distances. Locally, the soils are loamy overlying the parent siltstone and sandstone bedrock, but the route is dominated by clayey soils over shale. Depth to the shale ranges from a few inches to about 30 inches with exposures of barren shale along very steep slopes of the valley walls and along drainage ways.

Figure 3.1



Parent materials consist of shales, siltstones, and sandstones of the Bearpaw, Judith River, Claggett, and Eagle Sandstone Formations.

These soils are developed mainly on the Missouri River Breaks topography and are highly erosive. A description of the individual soil series characteristics can be found in Table 3.I. The following is a description of soils mapping units encountered along the various alternative routes. Where the routes follow county roads, the soil mapping units are not considered.

Delpoint-Cabbart Complex, 2 to 8% Slopes

Approximately 1,650 feet of Alternative 1, 11,200 feet of Alternative 2 and 10,000 feet of Alternative 3 would be included within this soil mapping unit. The Delpoint series consists of moderately deep, well drained soils that formed in material weathered from siltstone, sandstone, and shale. Cabbart soils consist of well drained soil that formed in material weathered from siltstone and sandstone. Depth to the platy sedimentary rock ranges from 10 to 20 inches. The table provides a general evaluation of these soils as a medium for plant growth. All properties of the soil necessary for a complete evaluation are not available; therefore, additional restrictive features may exist.

Alternative 2 would follow 300 feet on a very steep slope and another 300 feet on a moderately steep slope.

Both Delpoint and Cabbart soils have a high rating for corrosivity of steel. The shrink-swell potential is low-to-moderate. These soils are located on bench tops above the Missouri River Breaks.

Ethridge Silty Clay Loam, 0-4% Slopes

Approximately 1,500 feet of Alternative 1 and 3,100 feet of Alternative 2 would be included in this soil mapping unit. Some of Alternative 3 would also be in the unit. The unit consists of deeper well drained soils that formed in alluvial deposits. They are located on nearly level-to-gently-sloping terrain above the steeper Breaks. The table provides a general evaluation of these soils as a medium for plant growth.

These soils have a high rating for corrosivity of steel. Shrink-swell potential is rated moderate.

Cabbart-Shale Outcrop Complex, 25-60% Slope

Approximately 500 feet of Alternative 1 and 800 feet of the Alternative 2 route would be included within this complex. This map unit is a complex of Cabbart soils and shale outcrops on steep-to-very-steep broken slopes. Landscapes are mostly rough broken lands with stairstep erosional patterns, V-shaped valleys and ridges. See Table 3.1 for a general evaluation of the shale outcrop as a medium for plant growth.

The shale outcrops have a very limited potential for revegetation. They have a high corrosivity rating for steel. Shrink-swell potential is low-to-moderate.

Lisam-Dilts-Rock Outcrop Complex, 25-60% Slopes

Approximately 1,800 feet of Alternative 1 would be included in this complex while Alternative 2 would not encounter this soil mapping unit. Lisam and Dilts soils are formed in clayey material weathered from alkaline and acid shale or mud stone. They are located on steep and very steep slopes of sharp breaks and deep coulees. The shale rock outcrop occurs on the crests of ridges and along some small drainage ways. These soils are highly unstable because of mudflows and slumps which are especially common in steep terrain. Four-hundred feet of the Alternative 1 pipeline route would be located on these severely unstable soils (slopes near 60%). The table provides a general evaluation of Lisam and Dilts soils as a medium for plant growth. Shale outcrop is also described there.

Wherever Dilts soil and shale outcrop are located, revegetation potentials are very limited. Lisam soils are very restrictive because of clayey textures and shallow depth to shale. These soils are rated high for corrosivity of steel. Shrink-swell potentials are high. This might significantly increase the possibility of pipeline breaks.

Yawdim-Abor Complex, 25 to 70% Slopes

Approximately 1,800 feet of Alternative 1 and 1,200 feet of the Alternative 2 would be situated on these soils (Table 3.1). Alternative 3 would be composed of portions of each of the other two routes in this soil mapping unit.

These soils consist of steep and very-steep, shallow and moderately-deep, clayey soils over shale and, nearly barren shale outcrops, broken by deep, narrow valleys. Narrow divides between steep-sided canyons and buttes are common features of the landscape. Much of Alternative 2 within this unit follows a narrow divide or ridge top. Shales and siltstone outcrops are of the Judith River Formation with various colors and textures. The soil and rock are highly corrosive for steel and the water erosion potential is severe.The shrink-swell potential is also high.

Yamac-Benz Complex, 0-4% Slopes

Alternative 1 would include about 1,000 feet in these soils and the staging area on the north side would also be located in this map unit. Only 250 feet of pipe on Alternative 2 would be located on these soils, while the staging area on the north side would be located entirely in the unit. Alternative 3 would include approximately 5,000 feet on this map unit. The Yamac series consists of deep well drained soils formed in sedimentary alluvium (see the table). They are nearly level-to-gently-sloping fans, footslopes and terraces. Yamac soils have good revegetation potential.

The Benz soils are deep, well drained and formed in very strongly alkaline, stratified alluvium. They, too, are located on fans, footslopes and terraces.

TABLE 3.1 DESCRIPTIONS OF SOIL CHARACTERTISTICS BY SOIL SERIES

Soil Type	Salinity (MMHOS/CM)	Soil PH	Available Water Capacity (in/in)	Soil Erodibility Factor	Wind Erosion Group	USDA Texture	Rock Fragments (WT.PCT.)	Restrictive Features for Rehabilitation
Benz	4-20	Strongly Alkaline		.37	4L (Severe)	Clay Loam	<5%	Strongly Alkaline; Erosion Hazard
Cabbart	< 4	Mildly to Moderately Alkaline	.16	.37	4L (Severe)	Loam	<15%	Shallow depth to Sedimentary Bedrock; Erosion Hazard
Delpoint	< 4	Mildly to Moderately Alkaline	.16	.37	4L (Severe)	Loam	<5%	Erosion Hazard
Dilts	< 4	Strongly Acid	.13	.43		Clay	<15%	Shallow Clay Over Acid Shale, Severe Erosion Hazard
Ethridge	< 4	Mildly to Moderately Alkaline	.15	.32	7 (Slight)	Silty Clay Loam	<5%	Slight Limitations; Clayey Textures
Havre	< 4	Moderately Alkaline	.16	.28	6 (Moderate)	Loam	<5%	Slight Limitations; Erosion Hazard
Kobar	< 4	Moderately Alkaline	.15	.32	4 (Severe)	Silty Clay Loam	<5%	Slight Limitations; Erosion Hazard
Lisam	< 4	Moderately to Strongly Alkaline	.13	.43	4 (Severe)	Clay	<15%	Shallow Clay Over Shale; Severe Erosion Hazard
Neldore	< 4	Neutral to Medium Acid	.13	.43	4 (Severe)	Clay	<15%	Shallow Clay Over Shale; Severe Erosion Hazard
Shale			.0	.64	4 (Severe)	Clay Shale		Shale; No Soil; Very Severe Erosion Hazard
Thebo	< 4	Mildly to Moderately Alkaline	.14	.37	4 (Severe)	Clay	<5%	Clay Texture; Severe Erosion Hazard
Yamac	< 4	Moderately Alkaline	.16	.32	5 (Moderate)	Loam	<5%	Slight Limitations Erosion Hazard
Yawdim	< 4	Moderately Alkaline	.14	.37	4 (Severe)	Silty Clay	<5%	Shallow Clayey Soil Over Shale; Severe Erosion Hazard

Revegetation potentials of Benz soils are somewhat restrictive. Soils disturbed in this mapping unit should be stockpiled for revegetation and later seeded with native species which are the most tolerant to the alkaline soil. The soils are rated high for corrosivity of steel. Benz soils contain a moderate shrink-swell potential.

Kobar Silty Clay Loam, 0-8% Slopes

Alternative 1 would encounter these soils on the south bank of the river with the staging area and about 2,000 feet of the pipeline located in this map unit. The Kobar series consists of deep, well drained soils formed in alluvium. They occupy terraces, fans and footslopes. Kobar soils have good revegetation potential. Table 3.1 shows their potential as a medium for plant growth.

Corrosivity for steel is rated high, the shrink-swell potential is also high while water erosion hazards are slight-to-moderate.

Neldore-Shale Outcrop Complex, 15-60% Slopes

Approximately 12,500 feet of Alternative 1 would cross soils of this unit on the south side of the river. Shale outcrop is described in the table as is the Neldore series. The Neldore series consists of shallow well drained soils, formed in clayey residuum weathered from shale. They are on moderately-steep-to-steep slopes and generally very unstable with respect to mass wasting. The table summarizes the suitability of Neldore soils as a medium for plant growth. As indicated, revegetation potentials are considerably limited. Water erosion hazards are severe.

Yamac Loam, 1-4% Slopes

This soil is located on fans and footslopes on the south side of the river. About 1,850 feet of Alternative 1 and the staging area for either of Alternative routes 2 and 3 would be located in this mapping unit. Soils are described in Table 3.1.

Yawdim-Delpoint-Shale Outcrop Complex, 25 to 60% Slopes

Proposed infield lines that tie into the wells on the south side of the river would be located on these soils with about 11,000 feet of pipeline constructed in this complex. Shale outcrop is described in Table 3.1 above. Yawdim soils have developed on steep sedimentary uplands from residuum of calcareous claystone and shale. They are shallow and well drained. The table shows their potential as a medium for plant growth.

Yawdim and Delpoint soils are somewhat restrictive for revegetation so erosion control practices are necessary for successful revegetation. The soils are rated high for corrosivity of steel and the shrink-swell potential is rated high for Yawdim soils.

Dilts-Thebo-Neldore Clays, 4 to 60% Slopes

About 6,600 feet of infield lines on the south side would be within this map unit. Dilts and Neldore soils are discussed in Table 3.1. The Thebo series consists of moderately deep, well drained soils formed in shale. They have a clay surface layer and occupy level to sloping terrain of up to 15%. The table shows their potential as a medium for plant growth.

These soils are rated poor for revegetation because they are moderately deep over shale and too clayey. Corrosivity is rated high for steel and their shrink-swell potential is also rated high.

Thebo Clay, 2 to 25% Slopes

Approximately 5,000 feet of infield lines would be in this map unit containing mainly the Thebo series.

Dilts-Julin-Shale Outcrop Complex, 15 to 60% Slopes

Approximately 800 feet of infield lines would be in this map unit.

Neldore-Thebo Clays, 4 to 25% Slopes

About 4,000 feet on infield gas pipeline would be within this map unit. The individual series are described in the table.

WATER

All drainage in the area of this proposal is to the Missouri River. The Missouri River moves slowly as it meanders through fertile bottomland in the Missouri Breaks area, carrying an average annual volume of 6,700,000 acre-feet of water per year in the vicinity of the Alternative 1 crossing. The average streamflow of 7,759 cubic feet per second (cfs) at Fort Benton is discharged by a six-hundred foot wide channel that averages three feet in depth. The channel widens to over 1,000 feet in many areas where islands have forced the river to spread. At the community of Loma, the Marias River adds approximately 590,000 acre-feet per year, augmenting average streamflow by about 800 cfs. The velocity of the river decreases to about four miles per hour here, and the average depth increases to about 3 1/2 feet. Below the Marias River confluence about 525,000 acre-feet are contributed annually by tributaries joining the Missouri above Robinson Bridge, the largest of which is the Judith River. These tributaries increase the average streamflow in the Missouri by about 725 cfs as measured at the Fred Robinson Bridge station.

Annually, the river rises in response to spring snowmelt originating in the headwater drainages to the south and west. Average annual peak flows amount to about four times the average annual flow. These floods fill the active channel, thereby increasing significantly the average depth and flow velocity. Spring floods occasionally overflow the banks of the active channel, spreading water onto the floodplain. Such flooding begins at streamflow rates higher than approximately 36,000 cfs in the area of the Alternative 1 crossing. The frequency of occurence of these floods is shown by the

flood frequency curve (Appendix Figure 3.1). The largest flood ever recorded on the Missouri occurred in 1908 when an estimated 140,000 cfs was discharged in the Fort Benton area, causing much damage. Floods of 70,000 cfs in 1964, 75,000 cfs in 1953, 66,000 cfs in 1892, and, more recently, 59,000 cfs in June 1975, have also been recorded at Fort Benton.

Stream flow has been as low as 895 cfs in January, 1932 and 627 cfs in July, 1936, at Fort Benton. Minimum flows in recent years have seldom been below 2,000 cfs because of upstream flow regulation by 27 irrigation and power production reservoirs. Streamflows expected during the period of time the construction would occur probably would range between 5,000 cfs and 10,000 cfs. Hydrologic analyses of streamflow data on the Missouri including flow duration, flood frequency, and flow distribution analysis are contained in Appendix Figures 3.1 - 3.5.

The river normally carries large sediment loads. There is an increase in the amount of sediment transported by the river between Coal Banks Landing and the Fred Robinson Bridge (determined by analysis of water quality data obtained from U.S. Geological Survey studies at those locations). A graph of sediment concentrations for varying rates of streamflow illustrates the downstream increase in sediment concentration as shown in Appendix Figure 3.6. For the expected streamflow during the period of this proposal, sediment concentrations will probably be in the range of 70 milligrams per liter (mg/l)to 200 mg/l.

The chemical character of the Missouri River primarily reflects the geologic environment through which the river flows. A breakdown of major chemical constituents as averaged from 35 samples at Virgelle and 12 samples at the Fred Robinson Bridge is shown in Appendix Figure 3.7. At both places, the Missouri River may be characterized as a very hard, calcium-bicarbonate water. The figure shows an increase in all the major chemical constituents from Virgelle to the Fred Robinson Bridge with increases in sodium and sulfate being the greatest. The geologic environment through which the river passes consists of shales, siltstones, and sandstones. Waters from saline seep associated with these rocks are known to contain high concentrations of sodium and sulfate. One spring adjacent to the Stafford Ferry road (approximately one mile from the river) measured a sulfate concentration of 3,100 mg/1. High dissolved loads on tributaries to the river are probably a reflection of this local geological environment. Such streams may, therefore, account for major increases in the total dissolved solids. Total dissolved solids concentration at the Fred Robinson Bridge averages about 17% higher than concentrations in the Coal Banks area upstream.

VEGETATION

Vegetation of the Missouri River Breaks ecosystem can be grouped into three easily recognizable types. Two of these are grasslands and sagebrush-grasslands, principally ocurring on the benchlands above canyon rims and along the river bottoms as well as on some side slopes. The third is the timber type which is most commonly found on the steep slopes between the rim and river bottom. The timber is mostly Ponderosa pine and juniper, although some Douglas fir may be present. Classification beyond these three broad types is highly variable due to the complex topography present in the river breaks land form. Mackie, R.J., 1970, and Allen, E.O., 1965, have described vegetation subtypes found in the Breaks.

The following four photographs (Figures 3.2 - 3.5) depict the alternative crossing sites and show that plant communities compose small but discrete sites throughout the area according to the topographical position they hold.

The area falls within the Western Glaciated Plains geographical area and the 10-14 inch precipitation zone. The dominant plant species in this area are listed in Appendix Table 3.2.

At present there are no known threatened or endangered plant species in the immediate area of Alternatives 1, 2 or 3.

ANIMALS

The variations in topography, soil, and vegetation found throughout the Breaks provide for a diversity of wildlife habitats. A discussion of the fauna of this area must consider the possible presence of endangered species, several big game species, several upland game species, waterfowl, fish, raptors, predators and furbearers, small mammals, shore birds, other non-game birds, reptiles, and amphibians. Information available concerning some of these animal groups is fairly detailed and up-to-date; for other groups, information is either of a general nature or unavailable. Scientific names of animals mentioned in this section are given in Appendix Table 3.3.

Wildlife

An estimated population of 100 mule deer utilize habitats within the general area encompassing Alternatives 1, 2 and 3 with approximately 1,400 to 1,500 mule deer in the area of possible oil and gas industry activity south of the river. This is a resident population which exhibits very little seasonal movement. There appears to be slightly more use of the higher ridges and benches during the winter, probably because these wind-blown areas provide for better forage availability (Mackie, 1970). The pine-juniper stands and badlands topography serve as important cover areas. Mule deer are the most abundant big game species in the study area.

Antelope are also an abundant big game animal in

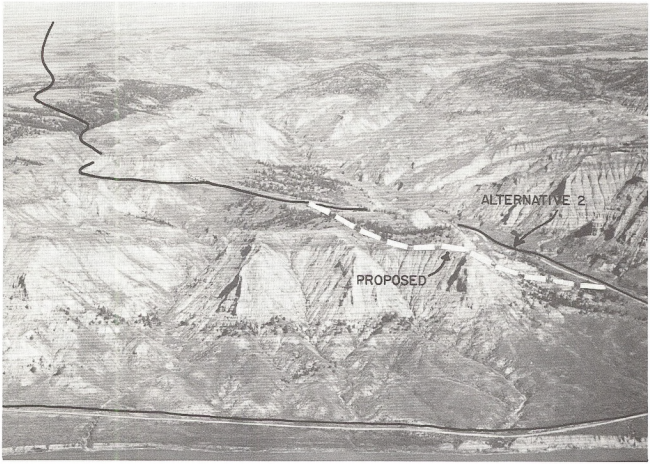


Figure 3.2 Aerial view showing the topography and vegetation on the north side of the river along the proposed and alternate 2 routes.

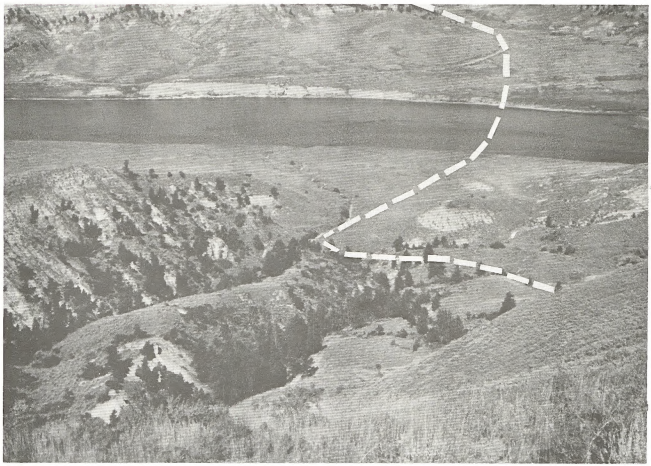


Figure 3.3 View from the rim on the south side of the river looking back along the proposed route.

Figure 3.4 This shows the general path of the alternate 1 route on the north side of the river.

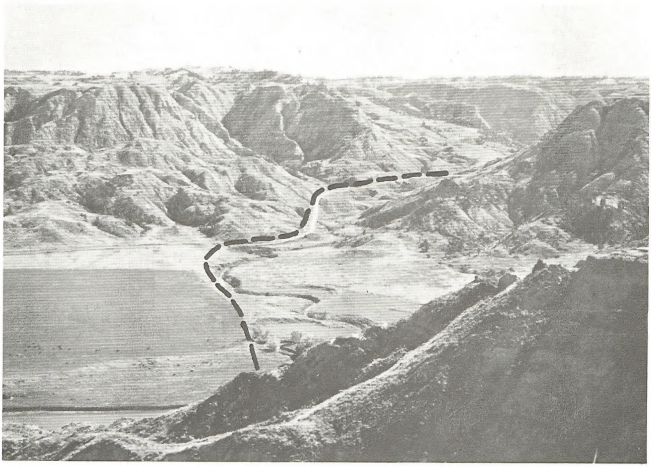


Figure 3.5 This photo was taken from the north side of the river looking toward the south side where the alternate 1 route follows the county road after crossing the alfalfa field shown.

the area. An estimated population of 90 antelope utilize the study area. This species can be found on the upland benches on both sides of the river. Scattered groups of antelope are found throughout the possible area of industry activity.

Sage grouse and sharp-tailed grouse are found through the study area though no breeding grounds have been discovered to date. Hungarian partridge and ring-necked pheasant are primarily associated with the agricultural lands on the upland benches.

The river provides important nesting habitat for Canada geese and mallard ducks which are the main waterfowl species found in the study area.

Animals classified as furbearers by the state include bobcat, mink, muskrat, and beaver, all of which may frequent the study area.

One hundred thirty-three species of birds are known to use this general area for nesting, with fifty-one species wintering there (Skaar 1975). A golden eagle nest is located within the general area of the Alternative 2 route. Bald eagles also winter along the Missouri River.

Nongame mammals which may be found in this area are the northern grasshopper mouse, western deer mouse, meadow vole, prairie vole, northern pocket gopher, least chipmunk, white-tailed jack rabbit, mountain cottontail, and the porcupine. Amphibians and reptiles which may be found in this general area are the woodhouse toad, boreal chorus frog, leopard frog, sagebrush lizard, western spray soft shell turtle, painted turtle, snapping turtle, bullsnake, plains garter snake, common garter snake, and the prairie rattlesnake.

Fish

Thirty species of fish are known to inhabit the Missouri River (Appendix Table 3.4). The river is typically a warm water fishery; however, trout or members of the salmonoid family have been taken in limited numbers during fish surveys at the Judith Landing and at points further upstream. Species of particular concern that range through the subject area are the burbot, channel catfish, northern pike, paddlefish, sauger, sturgeons, and walleye. Of these, the paddlefish is of the greatest concern as only seven known populations exist in the world today. Although populations are not threatened, the paddlefish has been in a gradual decline for many years primarily from alterations of habitat (Pflieger 1975, Rehwinkel 1975, and Vasetskiy 1971).

Migrating yearly upstream from Fort Peck Reservoir to spawn when flows increase and water temperatures reach 50 - 55° F (mid-May to mid-July), the paddlefish broadcast their eggs over silt free rubble bars. After spawning, adults return to Fort Peck Reservoir. Eggs hatch in 3-7 days, depending on water temperature, and larval fish (about 5mm in length) are thought to return to the reservoir rather than stay in the river. Little else is known about the paddlefish: where immatures spend their time, feeding habits of larval fish, their mortality and recruitment rates.

A recent study (Berg 1978) indicates that the Alternative 1 crossing site is a paddlefish spawning area.

Other migratory species of concern are the channel catfish, sauger, and walleye. Movement of these species in excess of fifty miles is common. Walleye and sauger are spring spawners utilizing gravel substrate, while channel catfish spawn much later when water temperatures exceed 75° F, utilizing cavities such as logs or holes in the bank.

The blue sucker, "a species of special concern" because of its rarity, has been taken within this portion of the Missouri during fish sampling efforts by Montana Fish, Wildlife and Parks. This species appears to favor the faster flowing rapids habitat where an abundance of insect life occurs. Little else is known about the life history of this species although scattered data on age, size and distribution in the Upper Mississippi River drainages is available. These reports indicate that the blue sucker is uncommon and that upper midwest states are responsible for its custodial maintenance and habitat(Christenson 1974).

Threatened and Endangered Species

Federally listed endangered species which may occur in the pipeline areas are the black-footed ferret, northern Rocky Mountain wolf, whooping crane, American peregrine falcon, and the bald eagle. Species of special interest or concern listed by the Montana Fish, Wildlife and Parks Department as of January 1979 which may occur in the study area are: long-legged bat, big eared bat, snapping turtle, spiny softshell turtle, plains hognose snake, milk snake, blue sucker, merriam shrew, preble shrew, upland sandpiper, long-billed curlew, mountain bluebird, bobolink, clay-colored sparrow, brewer's sparrow, and most hawks, owls, falcons, and both the golden and bald eagle.

PREHISTORIC AND HISTORIC FEATURES

Alternative 1 would transect a center of historic and prehistoric activity in the Dauphin Rapids locality of the Upper Missouri Wild and Scenic River. Options for cultural resource management in this locale include the possible acquistion of privately held lands and nomination of the area as a National Historic District. Such options reflect the importance of the area within and surrounding Alternatives 1, 2 and 3.

One of the prime features of the area, the Dauphin Rapids, was passed only with great difficulty by steamboats which often had to be pulled over this stretch of the Missouri. As timber was easily available there, the area was perfect for woodhawks who sold wood to the steamboats for fuel. A lonely and dangerous life theirs must have been as no less than seven woodhawker's graves are located below the Rapids, victims of an

Indian attack in 1869.

Woodhawkers gathered timber from the hillsides and bluffs above the Missouri and gathered driftwood from its banks. Timber clearings, abandoned felled timber, and cord wood piles, a skid trail to Boiler Bottoms, (Site 24FR224), the remains of the low wood or stone sod-roofed cabins, and the graves of the woodhawkers provide physical evidence in the Dauphin Rapids area locale of this historic activity.

Historic activity is also evident in an army wagon road initially constructed in 1869 to salvage the steamboat Peter Balen (wrecked at Dauphin Rapids) and to build a wing dam in the summer of 1876. Traces of the work camp are still visible. The name of the bottoms (Boiler Bottoms) surrounding the Dauphin Rapids' takes its name from the steamboat incident.

Homesteading activity is visible at the Sanford, McClelland, and Magdall homesteads. The first two homesteads were occupied about 1900, the latter during the 1930's. Jack McClelland established the original ferry across the Missouri River near his homestead, with the south access to the ferry being an old woodhawk skid trail and the north access the army wagon trail.

Prehistoric activity in the Dauphin Rapids area is largely unknown as an extensive cultural resource inventory has not yet taken place. An inventory initiated for this project has apparently yielded occupation sites of both long and short duration. No cultural values can be attached to these sites until an extensive inventory is made.

A prehistoric open occupation site (Site 24FR223) is crossed by Alternative 1. This site consists of hearth-like concentrations of fire altered and cracked rock, bone, charcoal, stone tools, and flakes. One area of the site has been graded and is only in fair condition, but other areas of the site are in good condition with cultural deposits buried an average of 10 centimeters (cm) below the ground surface. From the good condition of the site, the varied nature of the cultural remains, and the probable presence of datable artifacts, charcoal, and bone, Site 24FR223 would provide information important to local prehistory. No artifacts for temporary diagnosis were recovered.

The Alternative 2 route along the unnamed coulee to the east of Little Dog Creek yielded a two-component prehistoric site, (24FR222). One component consisted of a surface scatter of fire-cracked rock, bone, tools, and flakes which has been significantly disturbed by erosion, agriculture, and road construction. This surface component appears to be small, localized and overlaps the subsurface component only at the southern end. The subsurface component is approximately 75 cm below the ground surface and is exposed for a distance of 70 meters (m) by erosional cutting of the coulee. Fire-altered rock, large quartzite flakes, and bone were exposed by this cut. The area and extent of this site is currently unknown.

One site along the old army wagon road (Site 24BL63) has been identified. This site is a low-rock cairn constructed of sandstone slabs that have been transported 10 m from a natural outcrop. There is no indication of great age for this cairn and the site may be only a survey marker point. Further along this finger ridge, a broken end scraper and a piece of cast iron metal were located as random finds. No cultural material was found on the benches east of the ridge.

The old army wagon road (site 24BL74) lies within the Alternative 2 route. The road was constructed in 1869 and was in continuous use until the construction of the present Blaine County Road. Although the road has been improved by earth moving equipment, the switchback trail provides a historic visual feature to the area. A faint eroded trail which proceeds down a ridge spur with no switchbacks may be a portion of the original track or a woodhawk skid trail.

Along the access to the foot of the army wagon road are three prehistoric sites: 24BL71, 24BL72, and 24BL73. All are single-component sites with cultural materials buried between 3 - 22 cm below the ground surface. Sites 24BL71 and 24BL72 are close together with the former on the mouth of a coulee and the latter on an adjacent bluff. Both sites are characterized by hearths, lithics, and bone. Site 24BL73 also is on the mouth of a coulee and intact hearths containing fire cracked rock, charcoal, and bone are profiled by cut banks on the Missouri River. In addition, there is a surface historic component at this site, an earthwork and structure of unknown function and age.

On the north side of the river opposite the Dauphin Rapids are a complex of prehistoric and historic sites. The margins of these sites are so intermixed that the sites have been given separate classifications on the basis of function, rather than as discrete areas. In the case of 24BL40, a prehistoric site, this method may be erroneous. Cultural materials extend overa one kilometer (km) of terrace and it would take intensive study to differentiate the individual occupations. Sites in this complex include the historic sites of the Stafford Ferry (24BL38a), the Sanford Homestead (24BL35), the Double-Tripper Steamboat loading dock site and portage road (24BL36), the 1876 Army Corps of Engineers camp (24BL37), and a woodhawk cabin and grave site (24BL39). Prehistoric sites include sites 24BL38(b) and 24BL40. On the high terrace on the east end of Boiler Bottoms is a third prehistoric site, 24BL41. All prehistoric sites include subsurface remains of charcoal and bone as well as lithics, shell work, and fire cracked rock. As such, they will provide information significant to local prehistory. The heritage values of all sites (except the historic Stafford Ferry) are also very high.

AESTHETICS

Near the Alternative 1 route, the Missouri River Badlands landscape consists of highly eroded hillsides and a narrow floodplain, part of the Upper Missouri Wild and Scenic River. The river dominates the character of the landscape. The highly eroded nature of the area often results in spectacular formations caused by the differences in the erodibility between the shale and sandstone layers. Colors range from buff and shades of grays in the shales, to reds in the scoria, to browns in the Judith Sandstone. Vegetation is sparse with pines limited to ridgelines and or along the Judith sandstone formation. The sagebrush community predominates among the grasses. Fine-to-coarse visual textures are represented in this landscape.

The area along Alternative 1 on the south side of river is essentially free of cultural modifications. A county road and a homestead on the north side of river create a contrast with the natural landscape. The contrast is of low magnitude, which means it can be seen but does not attract attention.

The area has a Class A scenery-quality rating which is excellent. Landform and water were given maximum scores with color uniqueness, and vegetation following for characteristic landscape determination.

Two Visual Resource Management Classes are found along Alternative 1. In Class I areas (marked for preservation), natural ecological changes only are allowed. This area includes the "Wild" segment of the Upper Missouri Wild and Scenic River. VRM Class II areas are crossed by Alternative 1 on the north side of the river. Class II (marked for retention of landscape character) includes the "Scenic" segment within the river boundary plus adjacent lands outside the corridor.

A visual contrast rating worksheet has been filed for both VRM classes along this route. (See the Case File at Lewistown District Office, BLM, for these ratings and Appendix Figure 3.8 for the form used to make them.)

Near Alternatives 2 and 3, the landscape character is identical to that described along the Alternative 1 route except that developed hay fields and a river ferry operation are present. Cultural modifications exist on both sides of the river along these routes: a county road, power lines, and fences, plus ranch buildings are all located on the south side. An old wagon road is located on the north side. The magnitude of contrast with the natural landscape is rated as medium, meaning the contrast begins to attract attentionand to dominate the natural landscape. The area along Alternatives 2 and 3 retains a Class A scenic rating associated with Alternative 1, though these routes are entirely in VRM Class II, (passing through a "Scenic" segmentofthe Upper Missouri Wild and Scenic River). A visual contrast rating worksheet has also been completed for Alternative 2 (see the Case File).

RECREATION

Most recreation activities in this area involve use of the Upper Missouri Wild and Scenic River. Recreational use on the river has changed over the past 20 years. From limited use by local hunters and fishermen, it has rapidly expanded to include boating and camping through commercial and noncommercial operations. Over 30% of the boating use on the river passes by the location of alternative crossing sites near the Stafford Ferry.

In 1978, a total of 2,056 people (equalling 8,218 passenger days) were recorded on the river during the season from one week prior to Memorial Day to one week after Labor Day. This means 617 people passed through the location of the alternatives. The maximum use was recorded in 1976, when 672 people used the area.

Six commercial outfitters carry people along the river in addition to people traveling on their own.

Hunting and fishing activities are both popular in this area: hunter days recorded for big game, upland game, and waterfowl are estimated at 2-4,000, 8-16,000, and 2-4,000, respectively. (These figures are for the entire Missouri River corridor, not just the area encompassing the pipeline crossing sites.) All of these species' populations are either stable or on the increase. Although a warm water fishery, the Missouri River receives considerable fishing pressure along this stretch, mostly from the bank.

Sightseeing and hiking amount to nearly 40% of the leisure-recreational uses in the state (Montana Department of Fish, Wildlife and Parks, 1978) and this area is very popular for these purposes. People come by vehicle or boat to enjoy the spectacular scenery, view wildlife, as well as hike, camp, and fish. Off-road vehicle use is sporadic and mostly associated with other recreational activities such as hunting and fishing. Collecting (rocks, minerals, plants, fossils) is also a popular activity in the area.

WILDERNESS

Alternative 1 (Fuelco's proposed route) would cross the Chimney Bend and Ervin Ridge proposed Wilderness Study Areas (WSAs). Alternative 2 would cross the Stafford proposed WSA (Figure 3.6). Alternative 3 follows the county road and does not cross any WSAs. These potential WSAs have been examined on the ground and the following are the analyses of their wilderness values.

Chimney Bend

The area most affected by Alternative 1 is Chimney Bend (MT-068-245), an area of 16,600 acres in the northern most part of Fergus County. At this time, there

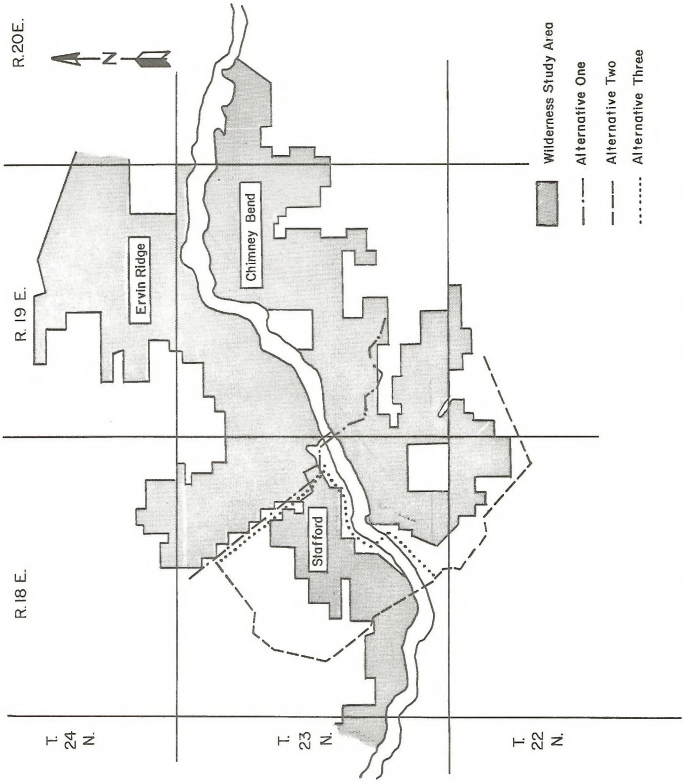


Figure 3.6 Three potential Wilderness Study Areas that might be affected by the pipeline.

are three closed in gas wells on public land (T. 23 N., R. 19 E., Sec. 27, 31, and 34) and an additional three wells on adjacent private land (T. 23 N., R. 19 E., Sec. 29, 33, and 34). These are the immediate target of the Proposed Action. An additional seven dry wells have been drilled within the area. Eleven vehicle trails penetrate the area's boundaries, five of which were placed or upgraded during Fuelco's exploration and drilling operations. These are standard bladed dirt trails, which are now rapidly eroding and revegetating.

Also in this area are 19 reservoirs (some eroded), 2 water savers, and 5 1/2 miles of fence. Stafford Ferry can be viewed and faintly heard from a few locations along the western edge of the area. Still, the overall feeling is of an unaffected and integrated ecological unit. The combination of deeply eroded drainages and timber tend to screen many of the above developments and limit their impacts mainly to the site of the development.

Chimney Bend's rugged topographical character is created by eroding drainages emptying into the Missouri River. Its comparatively large size, and its timber-screened ridges and deeply eroded drainages give it a high potential for solitude. A diversity of recreational opportunities, including hunting, fishing, hiking, camping, nature study, and outdoor photography, are available in the Chimney Bend area. Present use is light and is generally confined to hunting. Supplementary values include outstanding breaks type scenery and historical remains of the steamboat era (see the "Prehistoric and Historic Features" Section).

Ervin Ridge

Alternative 1 also crosses the western boundary of the 22,527 acre Ervin Ridge Roadless Unit (MT-066-253). The unit's topography consists of rugged, highly eroded terrain which drops steeply toward the Missouri River. There are, however, a number of flat ridge tops which allow easy access into the area. These flats have a number of human activities and improvements on them. The land modifications include 11 vehicle ways, 6 small reservoirs, 2 miles of scattered fence, 12 dry gas wells with 3-6 feet high marker pipes, 1 shut-in gas well, and 1 gas pipeline entering from the northwest corner. Most of these improvements, except for those associated with gas exploration, lie within the northern and eastern quarters of the unit; the other developments are primarily the result of past livestock management on the three licensed grazing allotments. The northern half is bounded by a few ranches while the western side is bordered by a seasonal road that connects to a ferry crossing, these activities being seen and heard from the ridge tops and areas directly facing them. Ervin Ridge has still retained much of its natural quality, however, due to its large size and topography which tends to screen many of the developments.

Opportunities for primitive and unconfined recreation are virtually identical to the adjacent Stafford Unit where hunting, and occasionally fishing, are the main recreational uses.

Stafford

Alternative 2 would cross the 7,177 acre Stafford Roadless Unit (MT-066-250) on it's eastern side. This unit lies within an area of rugged and highly eroded terrain that drops steeply towards the Missouri River. Human activity has been limited to the flatter ridge tops or river floodplains which lie outside the unit's boundary. The only improvements are five vehicle ways, totalling three miles, two small stockwater reservoirs, one mile of fence, and one dry gas well. Cattle grazing occurs on a seasonal basis and is limited by the terrain. Overall, the improvements have a negligible impact on the natural appearance of the unit.

The majority of the unit retains a high degree of solitude because of the natural appearance and screening. The eastern side, where Alternative 1 is proposed, has a moderate degree of activity. It has a seasonal ferry crossing and some farming units which can be seen and heard from the ridge tops or areas directly facing them. The unit also lies next to a "Scenic" section of the Upper Missouri Wild and Scenic River.

The lack of access into the area and steep terrain cause primitive or unconfined recreational use to be light. Current use is primarily limited to hunters and occasionally fisherman.

Other values are centered around a historic wagon trail, and the unit's scenery (see the "Prehistoric and Historic Features" and "Aesthetics" Sections).

SOCIAL AND ECONOMIC CONDITIONS

Pipeline construction would be located near relatively isolated portions of Blaine and Fergus Counties. This isolation would be the major factor behind most of the probable social and economic impacts.

The Missouri Breaks Grazing Environmental Statement Draft (1979) discusses in detail the general social and economic conditions of this area. The source data on population, per capita income, employment, and social well being are available in that document and are, therefore, not included in this chapter.

The population density within a twenty-mile radius of the Leroy Field is about one person per square mile, compared with close to two persons per square mile in the other portions of Blaine, Fergus, and Choteau Counties, and over five per square mile in Montana. The primary industry is agriculture with the per capita income and unemployment rate similar to the state average. However, the area has been gradually declining in population, matching the national trends toward a decline in rural population.

The town closest to the crossing area is Winifred which is located about 15 miles south of the Missouri

River. It has the nearest school system (K-12), gas/hardware station, restaurant, grocery store, and bar. The closest medical facilities and motels are in Lewistown (55 miles), Big Sandy (60 miles) and Havre (65 miles).

Heavy snowfalls and the lack of roads make much of the area within and near the Leroy Field impassable during the winter months. The Stafford Ferry is currently the only way to cross the Missouri at the proposed pipeline crossing without backtracking to the PN Ferry, located 14 river miles upstream and over 30 miles away by road.

LAND USE

Livestock Grazing

Virtually all of the public lands associated with Alternatives 1, 2 and 3 are under lease for livestock grazing. These lands are under an allotment management plan which specifies a specific rest-rotation grazing system.

Transportation

The major transportation system in this area is a county road system. This system consists of various roads of different standards. The primary road through the area is the Stafford Ferry Road which leads from Winifred to the Stafford Ferry and on the north to Chinook. This road is an upgraded road, with gravel surfacing on the majority of its length. All county roads are in poor condition in the Breaks areas. The Missouri River may also be considered as a transportation route although most of its use is limited to recreation.

CHAPTER 4

ENVIRONMENTAL IMPACTS

CHAPTER 4

ENVIRONMENTAL IMPACTS

This chapter analyzes impacts which are present after considering the mitigating design features included in the applicant's proposal. Consideration of short term uses, long term productivity and irretrievable resource commitments are discussed in this chapter and will not follow as separate chapter headings.

CLIMATE AND AIR QUALITY

A. Alternative 1

There should be no impacts to the local climate from the proposed action.

Pipeline construction activities such as welding, ditching, and vehicular travel may reduce air quality in the immediate area of operation for the period of time that this activity persists. This impact is anticipated to be short term and insignificant away from the area of operation.

Potential secondary impacts may occur if dust covers vegetation and surface cultural resource material within and adjacent to the right-of-way. These impacts would also be short term, difficult to quantify, and, in all probability, insignificant.

B. Alternatives 2 and 3

Impacts to climate and air quality from construction of either of the alternatives would be similar to those discussed above.

GEOLOGY

A. Alternative 1

Alternative 1 would lie along a major slumping area and could cause substantial problems if disturbed by pipelaying. Throughout the life of the project, slumps could cause breakage of the pipeline.

Vertebrate paleontological sites located within the pipeline route could also be adversely affected by construction. Fossils may be destroyed outright by earth moving equipment, or they may be vandalized by the construction personnel or others drawn to the area. However, a positive result could be the discovery of previously unknown sites by conscientious construction personnel. If found in time, they may be uncovered, but not destroyed and their scientific values preserved.

Vertebrate and plant remains are of increasing scientific interest that can be used in determining species affinities and the regional paleoclimate. Systemmatic collection of these fossils is desirable.

B. Alternative 2

This alternative would lie along a major fault zone, the age of which is undetermined and should be investigated. The problem of severe slumping seems to be less on this route than on Alternative 1.

Other environmental impacts would be the same as for the Alternative 1 route.

C. Alternative 3

Impacts would be similar to those described above.

TOPOGRAPHY

A. Alternative 1

The shale units of Alternative 1 can be easily disturbed by construction activity. As a result of this, there could be a great increase in mass wasting and gullying. Along with these impacts, there could be a heavy addition of sediments to the Missouri River (see the "Water" Section).

B. Alternatives 2 and 3

Impacts to the environment on either of these alternatives would be similar to those listed for Alternative 1 above.

SOILS

Environmental impacts for soils are considered under three major categories: soil erosion, soil mass wasting, and soil sterility.

Soils disturbed by the construction of pipelines, access roads, drill pads, and staging areas associated with oil and gas activity would be susceptible to accelerated erosion. The reasons for this are enumerated in theDistrict Programatic Oil and Gas EAR, Chapter 3, pages 5 - 6. That documentpoints out the significantly high erosion potential on fragile or unproductive soils of the Missouri Breaks.

Erosion hazards would be slight on proposed pipeline disturbances in the Cabbart, Ethridge, Delpoint, and Thebo soils which are located on the ridges and benches above the Breaks. Erosion would be severe on steeper slopeswhere Cabbart, Lisam, Dilts, Neldore, Yawdim, Delpoint, and Julin soils and rock outcrop are encountered on Alternative 1. Erosion as a result of the Alternative 1 route would be slight-to-moderate on soils in the bottom areas -including the Havre Yamac, Benz, and Kobar soils.

The following table summarizes the estimated water erosion hazard by location on Alternative 1. (Where the pipeline would follow county roads, no soil mapping unit is listed.)

TABLE 4.1

POTENTIAL WATER EROSION HAZARD ALONG ALTERNATIVE 1

Distance From the Point	Soils	Potential Water Erosion Hazard
0 to 800 feet	Ethridge Silty Clay Loam, 0—4% Slopes	Slight
800 to 3,150 feet	Delpoint-Cabbart Complex, 2—8% Slopes	Moderate to severe
3,150 to 13,650 feet	Pipeline in Country Road	Slight to moderate
13,650 to 17,750 feet	Lisam-Dilts-Rock Outcrop Complex, 25—60% Slopes	Severe
	Cabbart-Rock Outcrop Complex, 25—60% Slopes	Severe
17,750 to 18,750 feet	Yamac-Benz Complex, 0—4% Slopes	Slight to moderate
River Crossing (18,750 to 19,350 ft.)		
19,350 to 20,000 feet	Kobar Silty Clay Loan, 0—8% Slopes	Slight to moderate
20,000 to 33,800 (Terminal)	Neldore-Rocks Outcrop Complex, 15-60% Slopes	Severe

clay shale on Alternative 1 within the Lisam-Dilts-Rock Outcrop and Neldore-Rock Outcrop Complexes on steep slopes might lead to increased soil instability, or mass wasting. There is the possibility of mass wasting where the pipeline route would descend a steep slope in the north half of Section 24, Township 23 North, Range 18 East. At this location, excavation of a trench for the pipeline might disturb those layers in the soil which act to bind together the unstable material. The trenching might also increase the availability of water to the subsoil, the water acting as a lubricant in the contact between the soil and underlying bedrock, contributing to even greater instability. The magnitude of the impact of this disturbance cannot be quantified. Concern over mass wasting on the Alternative 1 route was brought about by the realization that the route would include about 16,200 feet subject to severe water erosion potential, and 400 feet of 60% slopes of Lisam-Dilts-Rock Outcrop Complex noted for instability.

Spills of oil and grease from heavy equipment and vehicles might affect the soil severely over a relatively small surface area. Toxic concentrations of these fluids are often capable of sterilizing the soil. Severe impacts could be anticipated on staging areas where changes of oil are often made, and where vehicles and heavy trucks are concentrated causing soil compaction. Moderate-to-severe impacts could be anticipated on access roads depending on the degree of use. Moderate impacts could be possible within the pipeline route and in unloading areas adjacent to the route.

B. Alternative 2

The table below summarizes the estimated water erosion hazard by location on Alternative 2.

TABLE 4.2

POTENTIAL WATER EROSION HAZARD ALONG ALTERNATIVE 2

Distance From the Point	Soils	Potential Water Erosion Hazard
0 to 3,150 feet	Ethridge Silty Clay Loam, 0—4% Slopes	Slight
3,150 to 7,450 feet	Route follows county road	Slight to moderate
7,450 to 18,650 feet	Delpoint-Cabbart Complex, 2—8% Slopes	Moderate to severe
18,650 to 22,350 feet	Cabbart-Shale Outcrop Complex, 15—60% Slopes	Severe
22,350 to 24,450 feet	Yawdim-Arbor Complex, 25—70% Slopes	Severe
24,450 to 24,700 feet	Yamac-Benz Complex, 0—4% Slopes	Slight to moderate
	River Crossing (24,700 to 25,350)	
25,350 to 27,200 feet	Havre and Yamac Loams, 14% Slopes	Slight
27,200 to 51,350 feet (Terminal)	Route follows county road	Slight to severe

The soils and rock outcrop areas along Alternative 2 have about 5,800 feet of shallow soils underlain by clay shale which have severe water erosion potential compared to the 16,600 feet of similar areas along Alternative 1.

C. Alternative 3

The soils along the portions of Alternative 3 that are not inherent in the other two routes are mainly Benz Clay Loam, Kobar-Silty Clay Loam, Havre, and Yamac Loams on fans and terraces. Slopes are one to eight percent. These soils have been described in previous sections. Kobar, Havre, and Yamac soils have good rehabilitation potential using standard reclamation procedures outlined in this document. Benz soils have somewhat restrictive potential for rehabilitation.

D. Infield Pipelines (South side of river)

The table following gives a summary of estimated water erosion hazard probable location for the infield collection pipeline for the six wells on the south side of the river.

TABLE 4.3

POTENTIAL WATER EROSION HAZARD ALONG INFIELD PIPELINES

Length of Pipeline (ft.)	Soils	Potential Water Erosion Hazard
11,000 feet	Yawdim-Delpoint Rock Outcrop, 4—60% Slopes	Severe
6,000 feet	Dilts-Thebo-Neldore Clays, 4—60% Slopes	Severe
5,000 feet	Thebo Clays, 2—25% Slopes	Moderate to severe
800 feet	Dilts-Julin-Rock Outcrop Complex, 15—60% Slopes	Severe
4,000 feet	Neldore-Thebo Clays, 4—25% Slopes	Moderate to severe

The areas with potential for mass wasting would be the same as along Alternative 1 for the Dilts and Neldore series and associated rock outcrops.

Sediment yield increases for Alternatives 1, 2, and 3 are summarized in the following section of this chapter.

WATER

Impacts on the water resource would include: sediment yield increases from erosion along the dryland pipeline, turbidity increases in the Missouri River during construction of the pipeline river crossing, oil, grease, and other petroleum fluid spills during construction of the dryland pipeline and river crossing, and possible future pipeline leaks of natural gas. All impacts would adversely affect water quality in the Missouri to varying degrees.

A. Alternative 1

Sediment yield increases would be about .044 acre-feet per year from erosion on this route. This increase would amount to sediment discharges of about 77 tons per year as compared with the Missouri's normal annual total sediment discharge of 300,000 tons per year. Thus, total increase in sediment load as a result of construction on any route would amount to less than five hundredths of one percent of the normal annual sediment load. Consequently, any of the three pipelines assessed would have a minimal impact on the sediment quality of the river.

Turbidity increases in the Missouri would depend on the capacity of the river to suspend the sediment particles. Estimates of the river's maximum sediment carrying capabilities indicate the possibility of raising sediment concentrations from the normal 135 milligrams per liter (mg/l) to about 20,000 mg/l during the construction of either route. This increase in turbidity would be of short duration. During certain periods of the year, the river's natural sediment concentrations exceed the anticipated maximum that could be expected from construction. Therefore, the overall impact on sediment in any of the river crossings could be expected to be minimal.

Oil, grease, and other fluid spills during construction of the pipeline could have an impact on the water. No major spills are anticipated. Small spills would not amount to severe water quality impacts since the dilution capabilities of the Missouri River are immense.

Possible future pipeline breaks could have an adverse impact on water quality. The magnitude of the impact would depend on the size of the break. This would be the same for any route.

Disturbance of streambanks would result in increased bank instability. Bank rock and vegetative cover has gradually, over time, established a protective armor against rapid bank erosion. Removal of the bank cover will leave behind unstable soils subject to more rapid scour and bank sloughing.

B. Alternative 2

Erosion from disturbed soils on this alternative would mean sediment discharges of 59 tons per year from sediment yield increases of .033 acre-feet per year. As mentioned, this alternative would have a minimal impact on the amount of sediment in the water.

The increase of turbidity and the danger of petroleum spills during construction would be the same for this alternative as for Alternative 1 as would the impacts of possible gas leaks in the river crossing. Impact to the river bank stability would be similar to that discussed under Alternative 1 also.

C. Alternative 3

The soils along Alternative 3 are mainly Benz Clay Loam, Kobar Silty Clay Loam, and Yamac Loam. Slopes are one to eight percent (these soils have been described in the section above). Kobar and Yamac have good rehabilitation potential using standard reclamation procedures outlined in this document. Benz soils have somewhat restrictive potential for rehabilitation. Sediment yield increases would be about twice as great as those associated with Alternative 1 because soils would be disturbed for an additional mile adjacent to the river. The overall impact on water quality would, however, be of short duration.

Streambank disturbance at the ferry would not create bank instability, assuming that the existing gradual bank slope (associated with the road) would be restored during rehabilitation.

VEGETATION

Native vegetation would be destroyed along access roads and the pipeline route during the construction phase of the pipeline. Vehicle travel along access routes might destroy vegetation due to compaction and physical damage to the plants. Along the pipeline route and within staging areas, excavation, blading, construction, and travel would also remove and damage native vegetation.

Short term productivity would be reduced on areas where the construction activities take place.

Vegetative cover and herbage production would be irretrievably lost on roads and trails that were not rehabilitated. Species composition along the pipeline route would be somewhat different from areas immediately adjacent to the pipeline.

A. Alternative 1

The impact on vegetation is directly related to reclaimability since destruction of vegetation would be a short term impact if it could be suitably reclaimed. A temporary loss of approximately 13 animal unit months (AUMs) of grazing could be expected.
Substantial areas of poor reclaimability potential occur along the alternative1 route. Timber would be the most difficult vegetation type to restore. Areas of steep slopes and fragile soils would also be extremely difficult to restore. These types of lands would be common along the Alternative 1 route. (See "Topography" and "Soils" Sections).

B. Alternative 2

Alternative 2 contains much less timber than is found along the Alternative 1 route. There are areas of steep slopes on the north side of the river but the soils are more resistant to erosion and mass wasting here than those soils along Alternative 1. Most of Alternative 2 on the south side of the river follows the county road, an area of previous disturbance. A temporary loss of approximately 15 AUMs could be expected.

C. Alternative 3

This Alternative follows the present county road. There will be no grazing loss associated with this route.

ANIMALS

Pipeline construction activities which would excavate, bury, overturn, clear, or grade areas of previously undisturbed terrestrial habitat would cause direct mortality to many small mammals, reptiles, amphibians, invertebrates, young birds, and eggs.

Additional roads and increased vehicle travel on them could increase road kills of big game, small mammals, and birds. It is also possible that the increased roadways could lead to indiscriminate shooting of animals and birds along the roadways.

Any activity or accident which would add toxic substances to aquatic habitats could cause death to fish, aquatic invertebrates, and amphibians in certain stages of life.

A. Alternative 1

Wildlife

The degree of impact from the physical destruction of habitat would be dependent upon the mobility of the species affected. Animals with the smallest home ranges would be those most severely affected.

Destruction of big game habitat would probably be minor due to the small amount of ground that would be disturbed and the greater mobility displayed by deer and antelope. Destruction of nesting habitat

would affect birds, either game birds or one of the other nongame ground or shrub nesting birds found in the area, but losses would probably be small. Local populations of small mammals could be severely reduced or even destroyed by the destruction of their habitat unless relocation of the population to nearby suitable unoccupied habitat occurs, which is highly unlikely. Losses of native vegetation would also likely reduce numbers of reptiles, amphibians, and invertebrates, but these losses are impossible to quantify.

Direct mortality, as well as further loss in habitat, would be an anticipated impact from a number of causes including construction activity and increased human use of the area, increased vehicle-animal collisions, and possibly illegal shooting of animals.

Fish

The most serious impact to the Missouri River fishery would be the sediment generated during construction of the river trench. The sediment produced in this phase would have a detrimental effect on all aquatic life forms (Cordone and Kelley, 1971; Phillips, 1970). Increases in sediment would reduce light penetration in the water, affecting photosynthesis of plants, algae, and phytoplankton, the smallest links in the Missouri's food chain. Sediment would also impair the respiration, waste removal, and reproduction of aquatic species by lowering the permeability of intergravels, reducing dissolved oxygen in the water and smothering spawning beds and invertebrates upon which many fish species depend.

As construction would take place during the low flow period in the early fall, siltation would not be diluted by high water. Heavy suspended material would settle out rapidly while river silt might be carried a considerable distance downstream. Paddlefish spawning areas would probably be covered to varying degrees but a direct impact on spawning paddlefish would probably not occur due to the time of construction. The Dauphin Rapids paddlefish spawning site could be rendered unsuitable for spawning, but more likely the substrate would be flushed of sediment during the spring runoff before the spawning season.

Impacts from sediment should be of limited duration, lasting only about two weeks, while continued slight impacts could be expected as the sediment settles out downstream toward Fort Peck Reservoir.

Other migrant species besides paddlefish that could be affected by the proposal are walleye, sauger, and channel catfish, all of which migrate more than 50 miles. Increases in turbidity could inhibit fish from moving up or downstream. Channel catfish might be particularly susceptable to this disturbance since they spawn much later than other species, generally when water temperatures reach 75-80°F, which may carry spawning into the early fall. During this period, altered flows, construction and turbidity might inhibit their movement.

The Missouri is well known for its rambling and destructive nature (Vestal 1964), and large gravel bars can be deposited and deep holes scoured on the bottom very rapidly. Should this crossing have a typical mud bottom, then an ice jam could cause rapid cutting of the channel by diverted flows. If this occurs, the pipeline would be exposed to considerable hydraulic pressure and could break, spilling natural gas into the river system. What effect this would have is unknown. Hydrogen sulfide would be the most harmful constituent of the gas to the fisheries. Analysis of natural gas from this area shows only a trace of hydrogen sulfide, however, not in sufficient strength to harm the fisheries.

If a substrate should be encountered that would require the use of explosives to open the trench, the impact would be fatal for all fish in the immediate vicinity of the charge. The affected area would vary depending on the size of the charge.

Impacts mentioned above would be relatively minor related to the fisheries population of the river as a whole.

Threatened and Endangered Species

The impact of the Alternative 1 route on Federally listed threatened or endangered wildlife habitat has been evaluated in accordance with the Endangered Species Act. Based on current information, this action would not affect any Federally listed threatened or endangered species or their critical habitat. Therefore, no consultation with the U.S. Fish and Wildlife Service is considered necessary (pursuant to Section 7 of the Act).

B. Alternative 2

Wildlife

Impacts to wildlife would be similar in type and probably in frequency as those discussed under Alternative 1.

The additional seven miles of pipeline necessary to complete this alternative would, at first glance, mean that wildlife would be more affected than on Alternative 1. This is true generally, as the number of miles of pipeline are usually in direct proportion to the amount of impact. However, there is less timber-type habitat on the north side of the river along the Alternative 2 route; thus, a lesser amount of important mule deer habitat would be disturbed. Also, most of the line to be constructed on the south side of the river lies along a county road, an area of previous disturbance, and therefore less overall impact to wildlife could be expected. Alternative 1 travels through totally undisturbed ground on the south side of the river by contrast.

A golden eagle nest which was active during the 1978 nesting season is located in the cliff area just west of Alternative 2 on the north side of the river. If construction activities were permitted during the breeding and nesting seasons of this pair of eagles, they could abandon the site.

Fish

General impacts to fisheries habitat from the construction of the Alternative 2 crossing are similar to those discussed for the Alternative 1 crossing, except that the impact to the paddlefish spawning area located 3.5 miles downstream at the Dauphin Rapids would be lessened.

Impacts previously discussed, such as sediment production and pipeline rupture, would still cause concern. Heavy siltation of the spawning site probably would not occur as settling and dilution of the sediment should reduce silt loads to levels lower than normal spring runoff before reaching the spawning area. This would not eliminate the silt from the picture as it would still be carried downstream the following year diluted by the spring runoff, causing impacts of varying degrees. However, it would be mixed with the normal silty loads of the Missouri and impacts should not be much more than normally experienced during high water.

Threatened and Endangered Species

Impacts to threatened or endangered species would be the same for Alternative 2 as for Alternative 1 with the exception of the golden eagle nest mentioned above.

C. Alternative 3

Impacts to wildlife would be similar in type and probably in frequency as those previously discussed under Alternatives 1 and 2.

PREHISTORIC AND HISTORIC FEATURES

A. Alternative 1

On Alternative 1, sites 24FR224, 24FR223, and 24BL62 would be adversely affected by line construction and maintenance activities, with the first two subjected to 95% and 55% physical destruction, respectively. The Magdall Homestead would be subjected to a visual impact of the historic scene around the homestead.

B. Alternative 2

On Alternative 2, site 24FR222 would be subjected to physical destruction, probably amounting to less than 15%. Site 24BL63 would not be subjected to any impact. The old army wagon road would be impacted over areas used as a project route.

C. Alternative 3

Should this route follow the existing Blaine County road, site 24BL38 (b) would be subjected to 20% physical destruction, site 24BL37 5% destruction, site 24BL36 5% destruction, site 24BL41 5% destruction, and site 24BL40 2% destruction. Sites 24BL35, 24BL36, and 24BL37 would suffer visual impact to the historic scene. Sites 24BL35 and 24BL39 should suffer no physical impact. If the route follows any line south of the existing road, all impacts would be much greater. Impacts from a line north of this road would not be less than for the road itself.

AESTHETICS

A. Alternative 1

Some adverse impacts would be caused along Alternative 1 in both Visual Resource Management (VRM) Classes I and II, with the greater effect naturally being on the Class I areas (those marked for ecological changes only). From points along the river (where most observers would be located), the observer would be able to see:

1. disturbances to ground cover by construction of the pipeline trench.
2. disturbances to ground cover by construction of access roads, a staging area and water bars.
3. construction of an unnatural-appearing structure on the landscape.
4. creation of unnatural color contrasts between the environment and the above-ground pipeline structure.
5. piling of soil from the river trench on the bank.

On the VRM Class I area in the Missouri's "Wild" segment (south side), the pipeline would have a high visual impact and would require mitigative measures. This impact should be of short term, unless there is extensive scarring of the soil and rock. In this case, rehabilitation could prove difficult (see the "Soils" Section, Chapter 4) and the scars would be visible for years.

The Class II areas (marked for retention of the landscape character), in the river's "Scenic" Segment (on the north side) and in the Breaks outside of the river corridor would also be adversely affected by the five items listed above. Any change in form, line, color, or texture is undesirable here and would also require mitigative measures. Again, the impact should be of short term unless extensive scarring occurs. If this happens, the pipeline could have a long term adverse impact to the visual resource of the area.

B. Alternative 2

This route has the same VRM Class II impacts as Alter-

native 1. No Class I areas are encountered. Unlike Alternative 1, however, these impacts would be mitigable and no long term visual impacts would occur.

C. Alternative 3

The same discussion given under Alternative 2 applies here also. In addition, the impacts on this route would be in the foreground visual zone. The route parallels the river corridor on both north and south sides which would make the short term impacts during construction more noticeable than those along Alternatives 1 and 2. Long term impacts would be negligible as the county road is a previous and permanent area of disturbance.

RECREATION

A. Alternative 1

Alternative 1 would not interfere with visitors' use but the quality of the recreational experience on the Upper Missouri Wild and Scenic River would be impaired during construction of the pipeline. This short term impact would be most severe when the river crossing is under construction as obstacles (such as heavy equipment or a dike) would need to be placed in the water. River travel, hunting, and fishing would thus be affected. Construction personnel and noise would disturb wildlife, while fish could be affected by silt (see the "Animals" Section).

Visual intrusions would reduce the scenic values of the area. All of these impacts should be of short term, lasting only during the construction phase of the project. This should also be true for camping, hiking and collecting as well as off-road vehicle use.

B. Alternative 2

The impacts for this Alternative would be the same as for Alternative 1 except, as noted in the section above, this route lies entirely in VRM Class II, meaning the visual effects would be less.

C. Alternative 3

The impacts would be the same as those discussed under Alternative 2. However, the general sightseeing qualities would be impacted to a greater degree along this route than along Alternative 2.

WILDERNESS

The visual effects of Alternatives 1 and 2 range from minimal offsite disturbances to major surface and perceptual impacts (see the"Aesthetics" and "Soils" Sections). If not mitigated to be nonimpairing, as defined in the "Interim Management Policy and Guidelines for Lands under Wilderness Review" (IMP), these impacts would eliminate several wilderness inventory units from future wilderness designation.

Impacts were projected through onsite observation, review of topographic maps of the area, and assumptions made by analysis of the project's scope and design as provided by Fuelco. Consequences of the proposed action were identified as impacts if they would be incompatible with wilderness as defined in the 1964 Wilderness Act and the Federal Land Policy and Management Act of 1976, (i.e., any activity which would change the naturalstate of an area, would affect its potential for wilderness designation).

A. Alternative 1

In addition to the visual impacts and the effects on soils previously discussed, Alternative 1 would also affect the natural appearance and the opportunities for solitude of the two wilderness inventory units through which it would pass (see Figure 3.6). Solitude would be most severely limited during the construction and rehabilitation phases by the sights and sounds of heavy equipment and the presence of construction personnel. Because of the steep slopes and poor soils encountered on this route, long term scarring in visible areas would leave an unnatural appearance (see "Aesthetics").

B. Alternative 2

Short term effects would be similar to Alternative 1. Only one wilderness inventory unit would be crossed by Alternative 2, while two would be crossed by Alternative 1 (see Figure 3.6). The soils on this route are more stable and would respond more readily to rehabilitation procedures. Long term scarring would not occur and the disturbed areas would appear natural after the four-year rehabilitation period detailed in the IMP.

C. Alternative 3.

This route does not cross any proposed WSAs and there will be no direct impacts to wilderness. In the short term, construction activities will create an offsite impact to solitude in bordering WSAs, but no significant long-term impacts are anticipated.

D. Infield Development

The gathering system to remove the gas from the six capped gas wells would be a grandfathered right as defined in the IMP. The six wells were drilled prior to October 21, 1976, the date of passage of the Federal Land Policy and Management Act (FLPMA). Logical pace and progression would include these wells going to production. In addition, the impacts associated with drilling the six capped gas wells have established a grandfathered right for further gas development of any pre-FLPMA lease owned by Fuelco within the Leroy Field and, in particular, the Chimney Bend proposed WSA south of the river (see Figure 4.1). New wells south of the river could be drilled and producing lines could be constructed so long as only impacts of the same nature as those already present were created. These actions could take place even if the activity would impair wilderness suitability.

SOCIAL AND ECONOMIC CONDITIONS

A. Alternative 1

The impacts of Alternative 1 would be slight increases in the amounts of property and severence taxes paid, increased income mainly in the Winifred area because of the influx of construction workers to the area, and the possible adverse effects these extra workers would have on local communities.

Winifred and the small towns surrounding the area would be incapable of housing the 30 to 40 workers needed to construct the pipeline. Most of these people would probably have to be housed in trailers around Winifred. Since the pipeline would be completed in four to six weeks these adverse effects would be minor.

Balanced against the adverse impacts are the benefits to the local stores,gas stations, and cafes that the extra people would bring. This, too, would be of short term.

B. Alternative 2

Impacts would be similar to Alternative 1 except disruption to the town of Winifred might be of slightly longer duration or greater magnitude. This is because Alternative 1 has more total pipeline.

C. Alternative 3

The impacts on this route would be the same as those discussed above. This alternative has the longest length of pipeline; thus, the impacts would probably be of slightly greater magnitude.

LAND USE

The following impacts would be the same for Alternatives 1, 2, and 3.

A. Livestock Grazing

It would be anticipated that there might be a temporary loss of some livestock forage as a result of surface disturbing activities. There would also be a possibility that livestock might be injured, killed, or trapped in open trenches during the excavating phase of construction. Disruption in the grazing management could occur if livestock were allowed to cross into rested or deferred pastures because of construction.

B. Transportation

Impacts on the transportation system would be anticipated to occur in the form of disruption in local traffic flow by vehicles used in construction of the pipeline. All routes follow the county road for access to the river crossing either on one side of the river or the other. Traffic might even be eliminated from certain portions of the road at various times. Road quality would also be affected as a result of transport vehicles going to and from construction areas.

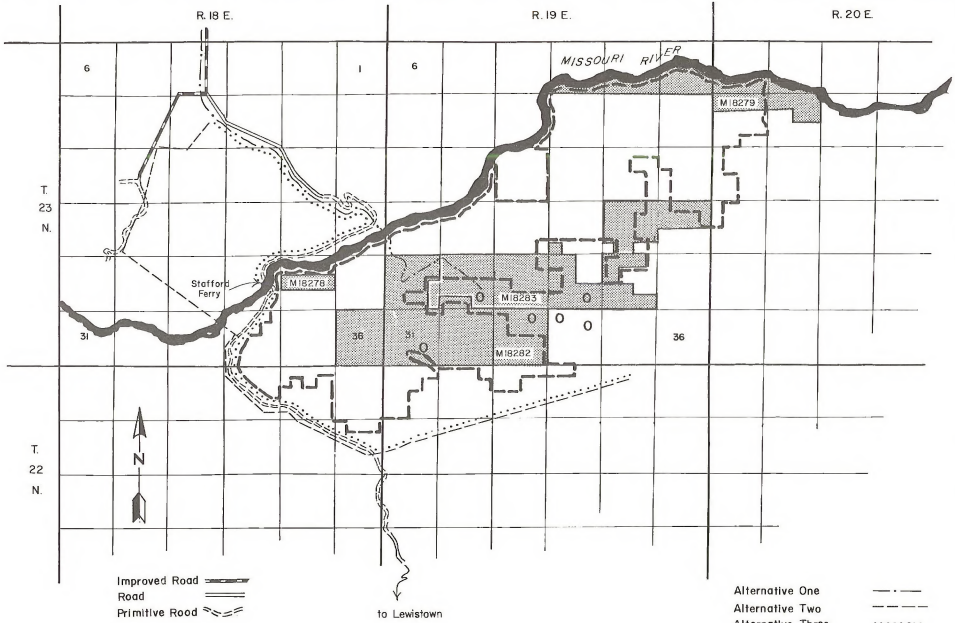


Figure 4.1 The area that would be affected by Alternatives 1, 2 & 3 showing the proposed Chimney Bend WSA and Fuelco's oil & gas leases.

CHAPTER 5

MITIGATING OR ENHANCING MEASURES

CHAPTER 5

MITIGATING OR ENHANCING MEASURES

Mitigating measures are those taken to minimize or eliminate any or all of the impacts discussed in Chapter 4. These measures are listed in numerical order under each environmental component. If the measure is a commitment made by the applicant (or otherwise enforceable), it will generally be indicated that this is the case. If a mitigative measure is applicable to a particular alternative, it will be so stated. Otherwise, the reader should assume that all measures listed apply equally to all alternatives.

These precautionary measures would mitigate effects previously discussed, except for those impacts specifically noted in Chapter 6 and those affecting wilderness. All measures listed for each environmental component in this chapter apply to wilderness inventory units, unless more restrictive measures are given in the Wilderness Section of this Chapter.

CLIMATE AND AIR QUALITY

1. Conduct all oil and gas operations in accordance with all State and Federal air quality standards and regulations.

2. Water roads and other areas of surface disturbance should dust and resulting air pollution become a problem.

3. Maintain and use applicable pollution control devices on internal combustion engines.

GEOLOGY

1. Conduct a surface paleontological clearance within the right-of-way along outcrops of the Judith River and Bearpaw formations. Additionally, if bone deposits are unearthed, cease construction until cleared by the Lewistown District Geologist.

TOPOGRAPHY

1. Recontour surfaces to the natural lay of the land where construction has created gross misfiguration of the natural topography.

SOILS

1. Impose daily restrictions on surface disturbing activities during inclement weather to avoid soil damage when wet.

2. Wrap and/or coat the pipe to protect it from corrosion in areas where soils are rated high for corrosivity (see soil descriptions in Chapter 3).

3. Clear all shrubs, rocks, woody debris, and trees from disturbed areas in a manner so as to minimize disturbance of surface soils. Stockpile surface soils (down to a depth of 4 to 6 inches) in separate windrows and respread over excavated and disturbed areas to the original depth during reclamation. These areas will be smoothed and firmed using appropriate equipment during the reclamation process. Surface soil material will contain viable seed and rhizomes in a natural mixture of species that were present prior to disturbance.

4. Place biodegradable jute mesh onto slopes greater than 30% in order to stabilize the soils until vegetation can be reestablished.

5. During the year following seeding of the pipeline route, examine all disturbed areas to determine if any water bars are needed to control runoff and erosion. This would be decided and designed by a team consisting of a BLM soil scientist and hydrologist who would then make recommendations to the pipeline company through the District Manager.

6. Mitigate any excavation or surface disturbance required to repair damage to the pipe in the manner prescribed above.

WATER

1. Require rehabilitation of all streambank disturbances by reshaping to original contour and protecting with riprap or vegetation. Use of rock riprap for stabilizing the Missouri River banks has not always proven successful in the past owing to the removal of the rock during ice breakup. River bottom gravel from the trench excavation is recommended for use as a bank stabilizing medium. It is charged with seeds of natural streamside vegetation and has been used elsewhere along the Missouri with success.

2. Install properly designed culverts at each drainage crossing along access roads. Loose rock protection is necessary along the banks of water courses where constructed slopes are likely to come in contact with a flowing stream. Loose rock, hand placed in the form of dry rubble masonry, will be put on all disturbed stream banks in sufficient thickness to preclude flowing water from coming in contact with supporting fill and washing it out. Culvert design will provide for the placement of prefabricated culvert pipe in conformance with the existing channel as near as possible and in a manner so as to permit a uniform velocity of flow above, through and below the structure. Where such design is not possible, discharge aprons must be provided.

VEGETATION

1. Disturbed areas of native vegetation will be reseeded at a rate of 12 to 14 pounds per acre with native species indigenous to the immediate area. Emphasis is to be placed on establishing western wheatgrass on clayey soils, prairie sandreed and bluebunch wheatgrass on the thin sites with shallow profiles and green needlegrass on the silty sites. Sagebrush will be seeded or transplanted along the river benches where the pipeline crosses those plant communities with an aspect of sagebrush. On those disturbed areas which have been previously seeded to non-native species, those same species will be reseeded so as not to contrast with what is presently there.

2. Begin revegetation only after the site has been satisfactorily prepared (See "Soils" - 3). This might include waterbarring, terracing, mulching or the placement of biodegradeable jute mesh where applicable to aid in maintaining the seedbed. Seeding can be done by using a farm type drill or by hand broadcasting. Seeds will be planted at a depth of 1/4 inch. Fertilizer is not recommended. No mulching is necessary on slopes less than 30%.

3. Limit access to the pipeline routes and to additional roads and trails required for construction.

ANIMALS

1. Control the length of open ditch to avoid undue hazards to wildlife or to domestic livestock. Earthen bridges will be provided where applicable in sections of open trench to allow animals to water. Livestock will be removed from pastures with open ditches and other hazardous construction activities to avoid injury or loss.

2. Require construction personnel to avoid wildlife and not to travel off established roads and trails. If construction workers were to live off the area (away from the Breaks ecosystem), the harassment to wildlife would be greatly lessened.

3. Construct the pipeline after August 1 to avoid bird nesting and brood rearing seasons.

4. Allow construction across the river only during the low water period in the fall to avoid impact to spring-early summer spawners.

5. Bury pipeline to a depth sufficient to eliminate scouring and breakage.

6. Locate block valves on both sides of the river to limit natural gas spills into the river should a rupture occur.

7. Do not take borrow material from the river, river bed, river bank or within 300 feet of the water unless it comes from the pipeline trench.

8. Construct new gates and supporting fence where the right-of-way crosses existing fences.

PREHISTORIC AND HISTORIC FEATURES

Possible mitigating or enhancing measures for prehistoric and historic sites located along the pipeline route include avoidance and salvage. The applicant has made a commitment to adjust or realign the routes to avoid anything of cultural significance. Avoidance of cultural resources might or might not be feasible due to other environmental or engineering concerns. In the case of mitigation by salvage, residual adverse impacts would necessarily occur as cultural resources are non-renewable. All final decisions regarding cultural resources to be impacted must be made in consultation with the State Historic Preservation Officer.

Site specific measures for mitigation are suggested below:

A. Alternative 1

1. Site 24FR223 — Avoid this site if possible. If not, salvage the material from the excavation. Make test excavations to determine the southeastern boundary and the significance of the site prior to construction.

2. Site 24FR224 — Avoid if possible. If not, salvage.

3. Site 24BL62 — Avoid if possible. If not, salvage material before revegetating the site.

B. Alternative 2

1. Site 24FR222 — Avoid if possible. If not, salvage. Dig test excavations to assess the significance of the site before construction.

2. Site 24BL63 — No mitigation necessary.

3. Site 24BL74 — (old Army road) — Avoid if possible. If not, restore all impacted areas. This restoration might be accomplished by recontouring the impact areas to their original slope and then excavating to the original trail location. The trail would be revegetated and closed to vehicular access until revegetation is complete.

C. Alternative 3

1. 24BL35 — Avoid.

2. 24BL36 — Avoid the area south and east of the Blaine County Road. North and west of the road, identify features and avoid if possible. If not, salvage and restore to present appearance.

3. 24BL37 — Avoid the area south and east of the Blaine County Road. North and west of the road, identify features and avoid if possible. If not, salvage and restore to present appearance.

4. 24BL38 — Salvage prehistoric component. Make test excavations to assess the significance of the site to above construction.

5. 24BL39 — Avoid.

6. 24BL40 — Avoid if possible. If not, salvage. Make test excavations to assess the significance of the site before construction.

7. 24BL41 — Avoid if possible. If not, salvage. Make test excavation to assess the significance of the site before construction.

8. 24BL62 — Avoid historic component. Avoid prehistoric component if possible. If not, salvage. Make test excavations to assess the significance of the site before construction.

AESTHETICS

1. Reshape the river crossing approach to conform with natural landscape contours along the river bank as discussed under the topographical section.

2. Remove minimal amount of vegetation (lift blade where practical) when cleaning the right-of-way and create an irregular shaped boundary line.

3. Rehabilitate the site with existing plant species near present composition levels and blend pipeline route cuts and fills with natural topographical elements.

4. Color any structures to blend with natural earth and vegetative tones.

5. Vary the distance between waterbars to break up continuity (See Soils 5).

RECREATION

1. Use warning measures to alert boaters of danger at the river crossing site during construction. Appropriate safety measures such as lights are necessary for both day and night.

WILDERNESS

To meet the nonimpairment criteria for wilderness, as outlined in the "Interim Management Policy and Guidelines for Lands Under Wilderness Review," the following mitigative measures must be applied. These mitigations are in addition to the others presented in this chapter. The objective for rehabilitation will be the reclamation of all construction impacts so that they are substantially unnoticeable in the wilderness inventory unit within four years after approval of the project.

One nonimpairment criterion set forth in the IMP is that the use or activity must be temporary: "A temporary use that creates no new surface disturbance may continue unless Congress designates the area as wilderness, so long as it can easily and immediately be terminated at that time, if necessary to management of the area as wilderness." Use of the pipeline would not be temporary because the life of the pipeline could be 30-40 years or more, depending on how much gas exploration is allowed and how much gas is discovered on the south side of the river. If Alternative 2 is selected, the impact to wilderness would be temporary. The team has determined that this alternative, which crosses the Stafford proposed WSA, could be reclaimed to an apparently natural condition within four years of project approval as defined in the IMP. After reclamation following construction, there should be no impairment to wilderness unless the pipeline ruptures. Then the impact would again be short term with successful reclamation. Permanent roads would not be necessary for pipeline maintenance.

Alternative 1 crosses two proposed WSAs and passes through several highly visible areas containing unstable soils. The mitigative measures would be applied if this alternative were selected but analysis shows that this route could not be properly reclaimed so as to be nonimpairing within the allowed time.

The following measures are the minimum required to meet the criteria of nonimpairment. All mitigation must be completed to a quality acceptable to the District Manager.

1. Place the staging area for the river crossing of Alternative 1 on the north side of the river. Place the staging area for the river crossing on the south side for Alternatives 2 or 3.

2. Along Alternative 2, portions of the existing wagon trail might be within the pipeline route or used to permit passage of construction equipment. After construction of the pipeline, the roadbed will be rebladed to its approximate prior location and condition. Close the trail to vehicle use and reseed the trail with native plant species.

3. Recontour cuts and fills on the pipeline route to blend with the natural topography.

4. All shrubs, rocks, woody debris, and trees will be cleared from the pipeline route in such a manner as to minimize disturbance of surface soils. Surface soils and herbaceous vegetation will be windrowed from all areas that are disturbed during excavation by blading with a motor patrol, bulldozer or other equipment to a depth of 4 to 6 inches on all soils.

5. Surface soils will be respread over the trench and other disturbed areas to a depth of 4 to 6 inches. They will be smoothed and firmed by using appropriate equipment. This surface soil material will contain viable seed and rhizomes in a natural mixture of species that were present prior to disturbance.

6. Initiate the restoration of native plant species to original appearance by reseeding. The seed mixture will consist of 5 pounds of western wheatgrass, 3 pounds thickspike wheatgrass, and 2 pounds of green needlegrass. The seeding rate will be at 14 pounds per acre. Seeding will be accomplished by hand broadcasting, mulching, and dragging with a chain or straight-tooth harrow. Fertilizer is not recommended on these seedings.

7. On steep slopes, hand spade straw mulch into disturbed soil at the rate of 1 1/2 tons per acre or place biodegradable jute mesh on them in order to stabilize

the soils until vegetation can reestablish. The particular slope and method used will be determined by the District Manager.

8. Provide irrigation to ensure seed germination in areas determined necessary by the District Manager. Irrigate only during the short fall season immediately after completion of the project. A portable irrigation system similar to the one described in Garcia, G., 1979, is recommended for use.

9. In areas where sagebrush was the predominant species, scrape sagebrush from work area. Disposal of dead sagebrush plants will be at the discretion of the District Manager. Seed or transplant sagebrush onto the excavation areas.

10. One year following seeding, the route will be studied to determine if water bars are needed to control runoff. Waterbars will be avoided wherever possible. Upon inspection by a soil scientist and hydrologist, a recommendation as to the placement of water bars will be made.

11. Right-of-ways granted through wilderness inventory units will not be construed as authority to use the right-of-way for emergency. Maintenance will be performed by means authorized by the District Manager or his representative.

12. Any excavation required to repair damage to the pipe will be mitigated by the methods prescribed above. Topsoil will be saved and original species of vegetation will be planted and maintained until natural succession occurs.

13. Paint any above ground pipe or pipeline markers a tan color.

14. No surface disturbing activities will be allowed when an authorized BLM project officer deems the ground too wet for nonimpairing use.

15. A BLM employee will be on the project site throughout the construction phase. (This employee will coordinate with company officials to control ground disturbing activities).

16. Motorized vehicles will not be used to monitor the pipeline in wilderness inventory units.

17. Along the Alternative 2 and 3 routes, a centerline survey (P-line) location will determine what and if any additional specific stipulations are required if necessary. A BLM employee will accompany Fuelco during the centerline route selection.

SOCIAL AND ECONOMIC CONDITIONS

1. Post the road to indicate construction traffic. Publicize any road closures. Require notification to floaters.

2. Meet with the community of Winifred to describe the project and allow advance preparations for the influx of workers.

LAND USE

1. Take measures to insure that travel along existing roads is safe during the time of construction. Roads and ditches should be reclaimed to original or better conditions.

CHAPTER 6

RESIDUAL ADVERSE IMPACTS

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RESIDUAL ADVERSE IMPACTS

Residual adverse impacts are those that would remain after the mitigative measures listed in Chapter 5 have been applied. If a residual impact is specific to only one of the alternatives, it will be so stated. Otherwise, the reader should assume that all residual impacts apply to all routes.

CLIMATE AND AIR QUALITY

There are no residual impacts to climate.

Impacts to air quality are generally short term; thus, no residual impacts would occur to this environmental component.

GEOLOGY

Problems arising from pipe being laid across major slumping areas cannot be readily mitigated and would probably remain as unmitigated impacts to the geological structures.

Paleontological sites destroyed by construction work would also be classified as a residual impact.

TOPOGRAPHY

There would be no residual impact to topography along any route after mitigative measures have been applied.

SOILS

Unusual climatic events causing erosion during and immediately following construction could have a significant adverse impact on the soil resource. Under normal climatic conditions, overall residual erosion impacts would not be great, assuming successful rehabilitation. Steep areas of shale rock outcrop and badlands have not been recommended for revegetation since they are largely unreclaimable. The impact of surface disturbance on these and other steep areas would probably have a long term impact on the visual quality along the river. As stated in the Upper Missouri Wild and Scenic River Management Plan, such disturbances are "very slow to heal." Typical soil units occupy steep slopes on the canyon walls making them readily visible from the canyon bottom.

Adverse impacts on soil mass wasting would be important wherever road cuts and/or pipeline trenching are required in areas of severe mass wasting (on Dilts and Neldore soils) on steep slopes. This could in all probability take place in section 24, T. 23 N., R. 18 E., if Alternative 1 is followed, and also from construction of infield lines in some areas on the south side of the river. Alternative 2 would not encounter Dilts or Neldore soils; however, a steep section of this pipeline on badlands soils north of the river could be affected by instability. This alternative, nevertheless, would avoid areas of severe mass wasting and is the more desirable from that standpoint.

WATER

The most important potential residual impact on water quality would be that caused by a pipeline leak. Such an accident could be expected to be rare. No other major adverse impact to water would be anticipated.

VEGETATION

Permanent loss of native vegetation could occur if newly constructed roads continue to be used for inspection and maintenance. This impact would be greatest when performed during wet periods. Recovery on other disturbed areas might occur several years after construction activities cease.

Accidental fires and spills of caustic solutions could cause significant loss of vegetation if they affect large areas.

Invader and noxious species of vegetation might replace native species on all disturbed sites if such a seed source is available. Spread of invaders to offsite areas, or land that is adjacent to the pipeline, would negatively impact the composition of vegetation.

ANIMALS

Most of the direct mortality to individual animals, as discussed in Chapter 4, might still occur. Destruction of small animals from heavy equipment would be unavoidable. Vehicle-animal collisions and illegal shooting of game and raptors would remain a possibility.

Accidental breaks in the pipeline could allow natural gas to enter the river.

PREHISTORIC AND HISTORIC FEATURES

Construction along Alternative 1 would cause a 95% physical residual adverse impact on Site 24FR224 and a total impact on the historic scene; in effect, the site would be completely destroyed. Because of its use as a trail and woodcutting area, mitigating or enhancing measures would be extremely difficult to carry out. Site 24FR223 would sustain an approximate 50% physical

residual adverse impact, given the most advanced salvage methods. Site 24BL62 would suffer residual adverse impacts on the historic scene unless a total revegetation effort were implemented.

Selection of Alternative 2 would cause less than a 20% residual adverse impact on Site 24FR222 if complete salvage were carried out along the direct buried route. Site 24BL63 would suffer no residual adverse impacts. The army wagon trail should suffer little residual adverse impact if mitigated by revegetation.

Alternative 3 would result in residual adverse impacts to sites 24BL36, 24BL37, 24BL38, 24BL40, 24BL41, and perhaps 24BL62. Sites 24BL35 and 24BL39 should suffer no residual impact if the visual impact of the pipeline is mitigated by revegetation. Such efforts would also mitigate visual impacts to the other sites.

AESTHETICS

The contrast ratings in Section G, Form 8400-4 (Appendix Figure 3.8), incorporate the mitigative measures listed in Chapter 5. These ratings are indicative of the intensity of the residual impacts and would define visual resource management (VRM) classes in which Alternative 1 would meet VRM objectives. In this case, the area on the south side of the river at the Alternative 1 route crossing would not comply with Class I objectives in the "Wild" Segment of the Upper Missouri Wild and Scenic River. The land/water body and vegetative features would still exceed the maximum element and minimum feature contrasts allowed under VRM Class I objectives. Regardless of how successful the mitigating measures are, the modifications to the elements in these two features would result in unavoidable visual impacts along Alternative 1. These adverse impacts would be a direct result of constructing the pipeline and would produce an irretrievable commitment of the visual resource.

There would be no residual adverse impacts along Alternative 2.

RECREATION

The pipeline project along all routes, where it can be viewed by recreationists, would produce visual intrusions which could reduce scenic values in relation to sightseeing opportunities.

WILDERNESS

Alternative 1

If Alternative 1 were selected, short and long term visual intrusions including right-of-way scarring caused by removal of trees and other vegetation, and erosion and slumping from destabilized soils would occur. Wilderness nonimpairment standards, as defined in the "Interim Management Policy and Guidelines for Lands under Wilderness Review" (IMP), could not be met within the allowable four-year period despite mitigating measures. Therefore, choosing this route would be contrary to Section 603(c) of FLPMA and the nonimpairment requirements of the IMP.

Alternative 2

Visual intrusions similar to those in Alternative 1 would occur in the short term. It is felt that because of the existence of more stable soils with a better potential for revegetation, reclamation of this route could be accomplished within the four years allowed in the IMP. No long term impacts would be anticipated with this alternative.

Alternative 3

This alternative would not cross a potential wilderness study area and no residual impacts to wilderness would occur.

Infield Development

There would be long term residual impact within the proposed Chimney Bend WSA as a result of the grandfathered gathering line construction and further gas development. Associated impacts such as roads, drill pads, right-of-way markers and well head monitoring devices would leave a permanent record of man's presence. Because Fuelco's pre-FLPMA leases are grandfathered, the additional impacts generated by further development could alter wilderness characteristics to the point of making the area unsuitable for future wilderness designation. These impacts could and probably would occur regardless of the construction of a pipeline crossing.

SOCIAL AND ECONOMIC CONDITIONS

If any of the routes were constructed, the most prevalent residual impact would result from a population influx from possible increased industry activity on the south side of the river. The town of Winifred, the closest community to this area, would experience some increased need for public services as a result of migration. Because the exact level of development and the level of implementation of mitigating measures are unknown at this time, it would be impossible to quantify the extent of residual social and economic impacts.

LAND USE

No residual adverse impacts would be anticipated to occur to land use as a result of construction of any of the routes.

CHAPTER 7

CONSULTATION AND COORDINATION

CHAPTER 7

CONSULTATION AND COORDINATION

PRELIMINARY CONSULTATION

Initially, the concept of a natural gas pipeline crossing of the river was discussed in a series of public meetings held on "A Management Plan for the Upper Missouri Wild and Scenic River" in 1978. Questioned as to whether they would approve, disapprove, or suggest a different location for this pipeline, most people stated that the pipeline should be allowed as long as the line didn't seriously detract from the environmental quality of the area. Many added that this pipeline should be of sufficient size to allow for further energy development without the need for additional construction.

PUBLIC INVOLVEMENT AND CONSULTATION DURING DEVELOPMENT OF THE ENVIRONMENTAL ASSESSMENT (EA)

Upon receiving a formal application by Fuelco for a proposed distribution line and river crossing site, BLM formed an assessment team and began analyzing the proposed route as well as others. Agencies and individuals that would be directly affected or those having needed expertise were consulted throughout the process.

The Draft EA was printed and released to the public on September 12, 1979. A list was made of agencies and individuals concerned, and each was sent a copy of the EA. In addition, copies were made available at city libraries and BLM offices in Glasgow, Malta, Havre, and Lewistown. A news release announced the availability of the Draft EA in most Montana daily and weekly newspapers and radio stations located within the Lewistown District, as well as some outside the area. The comment period ended on October 30, 1979, after one extension of time.

PUBLIC COMMENTS AND RESPONSES ON THE DRAFT EA

Comments on the Draft EA were requested and/or received from the following agencies and individuals. Those marked with an asterisk (*) submitted written responses.

Federal
Army Corps of Engineers *
U.S. Fish and Wildlife Service *

Montana State Agencies
Department of Natural Resources and Conservation
Department of Fish, Wildlife, & Parks *
Department of State Lands
Historic Preservation Officer *

Other Organizations
The Wilderness Society *
Fuel Resources Development Co.
Fort Benton Kiwanis *
Chouteau County Commissioners *
Montana Land and Mineral Owners Association, Chinook, MT *

Individuals
Dick Starks *
William D. Ross

Each letter received during the review period is presented in full with a response (where appropriate), following. Responses have been made to comments which raised issues bearing directly on impact analysis in the EA. Comments have been numbered with responses following by corresponding numbers. The letters are presented in the order in which they were received.

Note: Alternative numbering has been changed from that given in the
Draft EA. The Draft lists the Proposed Route plus Alternatives 1-5.
The Final EA lists Alternatives 1-6, the Proposed Route becoming
Alternative 1 and so on, as shown in the table below:

Draft EA (is the same as)	Final EA
Proposed Route	Alternative 1
Alternative 1	Alternative 2
Alternative 2	Alternative 3
Alternative 3	Alternative 4
Alternative 4	Alternative 5
Alternative 5	Alternative 6

MONTANA HISTORICAL SOCIETY

HISTORIC PRESERVATION OFFICE

225 NORTH ROBERTS STREET • (406) 449-4384 • HELENA, MONTANA 59601

September 27, 1979

Mr. John Fields, District Manager
Lewistown District, Bureau of Land Management
Drawer 1160
Lewistown, MT 59457

Draft EAR, Fuelco

Dear Mr. Fields:

#1 The Alternative 1 to the proposal to construct a natural gas pipeline in the vicinity of Dauphin Rapids, Missouri Wild and Scenic River, appears to be of less impact to historic and cultural properties, and is therefore more acceptable to this office than the proposal.

#2 Should your office determine to approve a right-of-way inspite of the obvious environmental impacts, please contact this office further for compliance with Sec. 106 of the Historic Preservation Act.

Thank you for the opportunity to comment.

Sincerely,

Edrie Vinson

Edrie Vinson, Program Manager
for
Ken Korte, SHPO

EV/prb

BLM
MAIL SECTION
ADM.
A. ADM. SERVICE
RECEIVED
SEP 28 1979 BLM
LEWISTOWN, MONTANA
FILE ..... VAL .....
NAV ..... BLUE ..... FILE
ACTION ..... VACEROS .....

RESPONSE TO STATE HISTORIC PRESERVATION OFFICER

#1. For this alternative (Alternative 2 in the Final EA), all prehistoric and historic features known should be mitigated by the mitigative measures given in Chapter 5.

#2. If a right-of-way is approved, your office will immediately be contacted.

DEPARTMENT OF THE ARMY
OMAHA DISTRICT, CORPS OF ENGINEERS
215 N. 17TH STREET
POST OFFICE AND COURTHOUSE
OMAHA, NEBRASKA 68102

REPLY TO
ATTENTION OF

MRCPD-A

4 October 1979

District Manager
Bureau of Land Management
Drawer 1160
Lewistown, MT 59457

BLM
ADMINISTRATIVE SECTION
A. ADM. SERVICE
RECEIVED
OCT 9 1979 BLM
LEWISTOWN, MONTANA
FILE ..... VAL .....
NAV ..... BLUE ..... FILE
ACTION ..... VACEROS .....

192 Please check in COE on what this is all about. J

Not from environmental dept

Dear Sir:

#3 We have received the draft copy of the Environmental Assessment Record for the Fuelco Natural Gas Pipeline Crossing of the Missouri River. In the future we would like to receive at least four copies of any report so this a comprehensive review may be completed in the short time allowed.

#4 Since the Missouri River is a navigable water of the United States, permits pursuant to Section 404 of the Clean Water Act and Section 10 of the River and Harbor Act of 1899 will be required.

Enclosed is our pamphlet entitled, "U.S. Army Corps of Engineers Permit Program," the necessary application forms, and sample drawings.

The form of lettering, conventional signs, etc. shown on the sample drawings need not be followed exactly; but the drawing must be of equal clarity and must be submitted on 8 x 15½ inch paper.

#5 Before any permit can be issued an environmental assessment must be written. A properly completed environmental questionnaire would greatly speed this process. Please fill out the inclosed questionnaire as completely as you can and attach photographs of the project site.

If you have any questions or desire assistance in the preparation of your application, please feel free to contact Regulatory Functions Branch, Operations Division, PO Box 5, Omaha, Nebraska 68101 or telephone Mr. Ralph Miller at 402-221-4133.

Sincerely,

John E. Veldenzeiger

JOHN E. VELDENZEIGER
Chief, Planning Division

2 Inclosures
As stated

RESPONSE TO CORPS OF ENGINEERS

#3. Four copies of the Final EA will be sent to the COE.

#4. The company making the application, Fuelco, is aware of the need for a Section 404 permit.

#5. The COE is welcome to use this EA if it will help meet the requirements of the applicant.

OFFICE OF
BOARD OF COUNTY COMMISSIONERS
CHOUTEAU COUNTY, MONTANA
FORT BENTON

October 9, 1979

DM 14 ASST. DM 5
RM 5 OFF. 3
ADM FA
F/E 2 AND 4 VACC
RECEIVED
USD OCT 10 1979 BLM
LEWISTOWN, MONTANA
PHIL VAL
NAV BLDG FILE
ACTION 2 VACC

Mr. Carl Lind
Bureau of Land Management
Drawer 1160
Lewistown, MT. 59457

Dear Mr. Lind: RE: Fuelco natural gas Missouri River pipe line crossing

We in local government are not able to be fully informed in regard to the multitude of regulations that beset our constituents in local government and the nation; however there are some basic concepts that reasonable men should be able to work out. We assume that each of us endorses the constitutional concept of "promoting the general welfare".

#6 It has been brought to our attention that some paddle fish spawning grounds and the possibility of some future broken gas lines are contibuting arguments for not allowing the construction of an eight inch natural gas line across BLM grounds and the Missouri River near the Stafford Ferry crossing in Blaine county, which also affects many of our people in Chouteau county.

The Carter administrations' policies on energy encourage the tapping of new energy resources, and becoming more self sufficient in energy. As a nation we import about 50% of our petroleum - yet it seems there are bureaucratic problems in negotiating the multiple use concepts of federal lands which in this case would surely benefit a large section of our states people, and indirectly other states by the development of a new source of home heating fuel. The unlocking of this already partially developed gas field, by the constructing of a gas line across the river, has the economic effect of providing new county tax bases, new wealth and new jobs. If our statistics serve us correctly RARE I has set aside 12.3 million acres for wilderness study in Montana, and in RARE I & II our nation has set aside almost 15% of the land area of our 11 western states. Surely man is also a part of this environment, and very few of our nations citizens are affluent enough to be able to back pack into the wilderness areas, and once they get into the interior, they usually come out to keep warm during the winter.

We believe our nation does have an energy crisis. We do not believe that the issues of a disturbed paddle fish spawning ground or the possible rupture of the gas lines crossing the Missouri River are valid arguments for stopping the completion of the development of the gas field in question.

We solicit your cooperation in helping "to provide for the general welfare".

Respectfully,

R. C. Peers
Chairman

Henry I. Grossman
Member

Oscar L. Stearns
Member

CHOUTEAU COUNTY COMMISSION

cc: Senator Melcher
Representative Marlenee
Harry W. Olson

RESPONSE TO CHOUTEAU COUNTY COMMISSIONERS

#6. The energy requirement of citizens has to be balanced against the need for recreational areas, wilderness areas, clean water, etc.

The two possible impacts you mention are not the only ones which could occur if a right-of-way is granted. Others are discussed in Chapter 4 of the EA.

The principal purpose of this assessment is to weigh the effects of this pipeline on the other values of the area. Your points about the nation's energy predicament will certainly be considered when a decision about the right-of-way is made (see Comment # 16 also).

Montana Land and Mineral
Owners Association
Box 054
Chinook, Montana 59523

October 8, 1979

DM 14 ASST. DM 5
RM 5 OFF. 3
ADM
F/E 2 AND 4 VACC
RECEIVED
USD OCT 10 1979 BLM
LEWISTOWN, MONTANA
PHIL VAL
NAV BLDG FILE
ACTION 2 VACC

Mr. Carl Lind
Bureau of Land Management
Drawer 1160
Lewistown, Montana 59457

Dear Mr. Lind,

The Montana Land and Mineral Owners Association has received a draft in regard to the Fuelco Natural Gas Pipeline. It would appear that the Bureau has made a pretty thorough study of all aspects in regard to Fuelco's proposed pipeline route as well as the several alternate routes.

Since the proposed natural gas pipeline was first discussed at the series of public meetings in regard to the Missouri Wild and Scenic River plan, our Association has been in favor of granting permission for a pipeline crossing across the river. Our thoughts on this were that if there was an energy shortage we should do everything possible to develop and encourage oil and natural gas production.

In regard to Fuelco's application for a river crossing, we felt it just made good sense for them to run their pipeline north across the river to connect with the Montana Power pipeline that goes to Great Falls. We believe that from a cost and mileage standpoint the cost of the proposed Fuelco route will be less than that of any other proposed route.

This past year both towns of Fort Benton and Big Sandy have tapped in to the Montana Power gas line from the Leroy and Bullwacker field to Great Falls. The supplemental gas from Fuelco's wells south of the river would give these towns added assurance of having natural gas in the future. We also believe that a pipeline across the river would result in more development work in the area south and east of the present shut in wells. If producing wells were found, the Net Proceeds Tax and other mineral taxes would certainly help the taxpayers in Fergus County from a tax standpoint.

#7 We are aware that there has been opposition from the Montana Fish and Game people to a pipeline crossing. They contend that the proposed crossing might destroy prime spawning ground of paddle fish, that there might be a break in the pipeline crossing that would release hydrogen sulphide gas in to the water, and that there would be a certain impact on the fish during construction. We do not believe these are valid arguments for holding up construction of the pipeline as proposed. The paddle fish are not an endangered species. We can not say there will never be a pipeline break on a pipeline river crossing any more than we can say that there will never be a tank car wreck on the railroad or an oil truck mishap on the highway. We can name and give locations of a half dozen natural gas river pipeline crossings in Minnesota, Iowa and Nebraska on the Mississippi and

-2-

Missouri Rivers that range in size up to twenty four inches. We are not aware of any particular environmental problems connected with these crossings. Closer to home, we have a natural gas pipeline crossing creeks and the Milk River. As far as we know there have been no problems.

It would seem that other possible environmental aspects such as effect on wild life, air quality, land use, aesthetics, vegetation, etc. have been considered in your study of Fuelco's proposed route. We do not claim to be too knowledgeable on all these subjects. We do, however, believe that any damage along these lines would be minimal as far as the proposed pipeline is concerned.

We appreciate the opportunity of presenting our views in regard to the Fuelco Natural Gas Pipeline. We hope a final decision in regard to the proposed pipeline will be given very soon.

Yours very truly

Harry W. Olson

Harry W. Olson, President
Montana Land and Mineral Owners Association

HWO/ar

RESPONSE TO THE MONTANA LAND AND MINERAL OWNERS ASSOCIATION

#7. As explained in Chapter 4 under "Fish", samples from a number of wells drilled in the Leroy Gas Field were taken and natural gas content analyzed. The amount of H_2S in this natural gas is minute; therefore, a rupture of the pipeline in the river should not release enough H_2S to be harmful to fisheries.

October 10,1979

RECEIVED
OCT 11 1979 BLM
LEWISTOWN, MONTANA

Carl Lind
Bureau of Land Management
Drawer 1160
Lewistown, Mt. 59457

RE: Fuelco, Missouri River Crossing

Dear Mr. Lind,

The Fort Benton Kiwanis consisting of sixty businessmen in the Fort Benton area voted at their regular meeting held October 9 1979 to go on record as supporting the request for a pipeline to cross the Missouri River below the Stafford Ferry.

#8 We realize this pipeline will have an environmental impact on the spawning grounds of paddle fish but do not feel this should stop the progress of the pipeline if satisfactory safeguards can be taken.

Thank you for your cooperation and support of this purposed pipeline.

Sincerely yours,

Harold A. Brown
Kiwanis President

HAB/kh

RESPONSE TO FORT BENTON KIWANIS

#8. The reader is referred to responses # 6 and # 7. The "Fisheries" Sections of Chapters 4 and 5 of this report should give more insight into the anticipated impacts on paddlefish and the necessary mitigation required to safeguard their habitat should construction be allowed.

DIV.	PLANNING
RM.	DIV.
RM.	DIV.
DIV. DIR.	
REC.	
OCT 12 1979	
LEWISTOWN, MONTANA	
FILE	
INFO — FILE	
ACTION	

Missoula, Mont.
Sept 30,1979

RE: Fuelco National Gas Pipeline

Bureau of Land Management
District Manager
Drawer 1160
Lewistown, Mont. 59457

Dear Y. Kind, Acting District Manager,

Sir,

I would like to enter a formal protest for the proposed Fuelco Natl. Gas Pipeline, as s d in the "Environmental assessment record-Fuelco National Gas Pipeline", draf , mailed to me, dated Sept 19,79. Said crossing of Missouri River at or near and "Decamp-McFallen" Ferry. Said pipeline is listed in Figure 1-3 of said d 6 to be approx. 2 miles down stream from above mentioned Ferry.

I object to this location for various reasons mount then being the close proximity to the "Wood Duck" activity in the area & visable, physical evidence on said activity in the area. Also to the actual crossing site due to the shallow depths of the river at this point. Also being below a fast stretch of water- Dauphine Rapids. This could cause excessive scouring to the river bottom under certain water conditions. This condition would leave a scar on the river for years to see to testify to some actions in the fragile area.

(#8) I feel that more logical crossing would be in the area of the Stafford-Ferry, using the existing county road site-way far the actual location of said pipeline.

I feel that for most involved & damage done to a fragil & critical area that all effort should be directed to a crossing that would leave as little scars as this area as possible. As the county road is already a scar, it should be used from the ferry up said road to the top of whiskey ridge & then proceed to the well area. The ferry crossing would be made in deep water thus reducing the chance for scouring action by current on the river bottom.

I have made several trips along this stretch of the river & never cease to be amazed at the hard ships & trails the early day people must have endured to a make this state of ours & the western states such a wonderful place to live.

In closing I wish to thank you for the opportunity to make a few remarks which I hope will benefit all who are concerned about the Missouri River.

Yr "Dick" Starks
1935 Oriole
Missoula, Montana 59801

Dick Starks

RESPONSE TO LETTER FROM MR. DICK STARKS

#8 Alternative 3 totally follows the county road its' entire distance and crosses at the Stafford Ferry. Both Alternatives 1 and 2 follow the county road for substantial distances, but cross the river below and above the Ferry, respectively.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Billings Area Office
Federal Building, Room 3035
316 North 26th Street
Billings, Montana 59101

IN REPLY REFER TO:
ES

October 11, 1979

DIV.	PLANNING
RM.	DIV.
RM.	DIV.
DIV. DIR.	
REC.	
OCT 15 1979	
LEWISTOWN, MONTANA	
FILE	
INFO — FILE	
ACTION	

MEMORANDUM

TO :District Manager, BLM, Lewistown District, Lewistown, Mont.

FROM :Area Manager USFWS, (ES)

SUBJECT :Draft Environmental Assessment Record for the Fuelco Natural Gas Pipeline

We have reviewed the subject document and find its description of existing fish and wildlife resources and the discussion of probable impacts of the proposed project on these resources to be adequate.

(#10) It is our opinion, however, that the discussion of project alternatives is not adequate. In particular, we feel that a more thorough assessment of Alternative 2 is needed. It appears that by following this route, and crossing the river at crossing #3, the pipeline could be located adjacent to the existing roads for almost its entire length, both north and south of the river. This route, labeled Alternative A, is shown in Figure 1.6 of the draft EAR, but received little attention in the report. It is unclear as to why this route would be more environmentally damaging than either the proposed or Alternative 1 routes, both of which include segments that run cross-country, not following the existing roads. As you know, the Department of Interior is presently on record with the Corps of Engineers requesting that the Section 404 permit for the project be held in abeyance. We do not plan to modify that position until after we have additional information regarding Alternative 2. In this connection, you will be contacted by either Bill Jones, Mike Erwin, or David Kaufheimer of this office (406-657-6780).

(#11) We are also unclear as to whether or not the portion of the proposed route lying north of the river will follow the road in that area. The draft EAR makes no mention that it will, but it would appear that by following the road fewer adverse environmental impacts would occur. If the proposed route does not follow the road, we suggest that the consequences of following it, both with regards to the proposed route and Alternative 2, be addressed.

Of the two routes discussed in detail it is our view that Alternative 1 is preferable to the proposed action in terms of impacts on the fish and wildlife resources of the area. This alternative would significantly reduce the possibility of adversely impacting the peregrine spawning site at Dauphin Rapids (the location of the river crossing in the proposed action). The Alternative 1 route would also result in fewer impacts to wildlife as most of the construction south of the river would be along an existing county road. North of the river it would result in less destruction of the scarce timbered habitat. Concerning the problem associated with the golden eagle nest located beside this route, conflict would be eliminated by scheduling construction in that area after the young birds fledge.

We appreciate the opportunity to comment on this draft EAR.

Wally Hunter

RESPONSE TO THE FISH AND WILDLIFE SERVICE (FWS)

#10. Alternative 2 (Alternative 3 in the Final EA) is now discussed on the same level as the Proposed and Alternative 1 routes (Alternative 1 and 2 in the Final EA).

#11. The Proposed route (Alternative 1) on the north side of the river follows as closely as possible the existing road. However, at the steepest and most unstable portion, the pipeline route deviates from the road because of a series of switchbacks. Alternative 2 (Alternative 3 in the Final EA) does not deviate from the road.

STATE OF MONTANA

DEPARTMENT OF

FISH AND GAME

Helena, MT 5960
October 15, 1979

RECEIVED
OCT 22 197
LEWISTOWN, MO

Mr. John Fields, District Manager
Bureau of Land Management
Airport Road
Lewistown, MT 59457

ATTENTION: Mr. Tad Day

Re: BLM Draft Environmental Assessment Record on Proposed Fuelco Pipeline

Dear Mr. Fields:

We have reviewed the BLM draft environmental assessment for the proposed Fuelco Natural Gas Pipeline and have the following comments:

#12 The economic factors presented in Chapter 1 in comparing the proposed action to various alternatives are inappropriate at this stage of the environmental assessment report. Initially, the proposed crossing site should have been evaluated and compared to various alternatives only on the basis of environmental consequences. The economic comparisons should be made separately, initially, and then combined with the environmental analysis at a later stage.

#13 It is questionable that alternatives 3 and 4 are not economically sound. Fuelco indicates that proven natural gas reserves in the Leroy Field amount to 2.5 BCF with additional probable reserves of 3.0 BCF (pages 1-17). Outside of the Leroy Field, within a 20-mile corridor of the river from the PN Ferry east to the Fred Robinson Bridge, Fuelco expects to find another 10-16 BCF of recoverable gas (page 1-9). The present market values of natural gas range from at least $1.00 per MCF to over $3.00 per MCF. This would bring the present market value of the expected recoverable natural gas on the south side of the Missouri to somewhere in the range of $15-$65 million. This is probably a conservative estimate, since future gas prices over the life of this project are likely to rise much higher.

It is also questionable that the additional cost of alternatives 3 and 4, $1 million and $3.6 million, respectively, could not be recovered over the lifespan of the gas wells.

#14 On page 1-5 of the assessment, it was indicated that "sufficient site-specific information was not available to compare the impacts of Alternate Routes 3 and 4 to the other routes." Therefore, this report simply does not present a fair assessment of these alternatives. In our view, alternate routes 3 and 4 are viable alternatives, and the environmental consequences of these routes should have been compared to the

other alternatives. We do not necessarily agree with BLM's assessment on pages 1-17 that "the environmental impacts of Alternative No. 4 are appreciably greater than the impacts of the proposed route or Alternative No. 1." We believe that the potential environmental impacts of the proposed route would be greater than the impacts of any of the alternatives.

#15 The Montana Department of Fish, Wildlife and Parks does not necessarily oppose transmitting natural gas from the south side of the Missouri River to the north. Our recommendation simply is that utility and pipeline crossings of the river be routed through established transportation corridors. This position would also seem to be in better compliance with the Wild and Scenic Rivers concept. The established corridors are usually designated in recreational segments which more easily allow for activities such as pipeline or utility crossings. Site-specific information to evaluate environmental impacts should already be available for the PN Ferry corridor, since this information would have had to have been reviewed for the new bridge crossing at PN. The Department of Fish, Wildlife and Parks has already agreed that a bridge crossing at PN is appropriate. We suggest that the bridge itself could be used as a support for carrying a pipeline over the Missouri River, thus eliminating the need to disturb the river channel.

#16 We also believe that Alternative No. 5 is a viable option. The obvious advantage of delaying action on the pipeline crossing would be to allow time for better evaluation of the extent of the gas field to be developed on the south side of the river. When the extent of the entire field is known, the best location for a pipeline crossing could be better determined.

#17 The paddlefish fishery in the Missouri River and Fort Peck Reservoir is a valuable resource on a regional as well as state basis. The Montana Department of Fish, Wildlife and Parks is responsible for protecting that resource. We believe that since alternatives to burying the pipeline in an area recently identified as spawning grounds for these unique fish are available, it is imperative to utilize an available alternative rather than disturb these spawning areas.

#18 In summary, we feel that siting a natural gas pipeline across the Missouri at this time is premature, since much of the potential area for gas production is as yet unexplored. When the full potential of the field is known, perhaps a single more suitable crossing site for the entire field can be chosen.

Also, southerly distribution of gas from this field would eliminate a Missouri River crossing altogether. Therefore, our preferred course of action at this time would be Alternative No. 5, (the "no action" alternative) or Alternative No. 4, (southerly distribution of the gas).

If a natural gas pipeline must be constructed across the Missouri, then it should be accomplished with the least possible intrusion into the Wild and Scenic portions of the river and as far as possible from the paddlefish spawning grounds at Dauphine Rapids. Suspending the pipeline from the new bridge to be constructed at the PN site (Alternative No. 3) would accomplish this.

Sincerely,

Fletcher E. Newby, Acting
Robert F. Wambach
Director

RFW/RKB/sd

cc: Environmental Quality Council
Nels Thoreson
Dick Johnson
Rod Berg
Kerry Constan
Norm Peterson

RESPONSE TO THE MONTANA DEPARTMENT OF FISH, WILDLIFE, AND PARKS (MDFWP)

#12. BLM regulations and environmental assessment guidelines dictate that social and economic conditions be addressed concurrently with the natural resource components. Since the statement was made on page 1-5 of the Draft EA that "Alternatives No. 3 through No. 5 (Alternatives 4-6 in the Final EA) are discussed only in Chapter 1 for a number of reasons", it was appropriate to mention the most important factors which lead to these alternatives not being carried through the remaining chapters. Economics was one of the most important factors.

#13. Fuelco estimated that 10 to 16 BCF might be discovered in this area, but not entirely by Fuelco. The bulk of the land in question is leased to a number of other companies. The cost/benefit analysis for Fuelco's operations had to be calculated on the basis of the reserves of Fuelco's six proven wells plus their estimate of probable reserves from four to six wells in the Leroy Field south of the river.

#14. Initial assessment revealed that the Alternatives 3 and 4 (Alternatives 4 and 5 in the Final EA), were not nearly as environmentally and/or economically acceptable as the Proposed and Alternative 1 and 2 routes (Alternatives 1, 2, 3 in the Final EA). Therefore they were dropped from further consideration. A comparison of impacts for all alternatives is shown on the matrix on page 1-8 of the Draft EA.

#15. We stand on our reasoning given on page 1-16 of the Draft. Why construct an additional 25 miles of pipeline through the fragile "Breaks" ecosystem (which is excellent terrestrial wildlife habitat) when, in all probability, no additional reserves exist in the immediate area and no other wells would be tied into the system? The general location of Alternatives 1, 2, and 3 is in an established transportation corridor as indicated by the county road and Stafford Ferry.

#16. The President's address on Energy and National Goals, July 15, 1979, urges those processing right-of-way applications to expedite energy-related projects as much as possible. If BLM were to delay until the entire gas field on the south side of the river becomes known, it would probably be 10-20 years before a distribution pipeline was constructed.

#17. Fuelco organized a meeting between themselves and the MDFWP last spring at your Regional Headquarters in Great Falls. Three BLM employees were in attendance. It was our understanding that all parties agreed that in all probability the impact to the paddlefish would be negligible from such an underwater crossing. Mr. James Posewitz of your organization seemed more concerned about the impact of H_2S leakage in the river if the line should break. Because of that concern, BLM obtained samples from wells in the area and found that the quantity of H_2S from gas in this area to be very insignificant.

#18. The Option Summary at the beginning of the Final EA more fully weighs the consequences of these alternatives.

The Wilderness Society

107 West Lawrence, Helena, Montana 59601
Mail to: P.O. Box 1184

October 28, 1979

RECEIVED
USD OCT 30 1979 BLM
LEWISTOWN, MONTANA

Mr. John F. Fields
District Manager
Bureau of Land Management
Drawer 1160
Lewistown, MT 59457

Dear Mr. Fields:

Please accept this letter as comment on the draft FUELCO natural gas pipeline Environmental Assessment.

The proposed FUELCO pipeline is but an incremental step toward full field development and extension of the Leroy natural gas field on the benchlands south of the Wild Missouri. In general, the on-site construction of the pipeline is not too serious of a problem since many of the related impacts can be mitigated so long as strict reclamation standards are enforced.

The real issue concerns the long-term impacts of developing a series of gas fields. The adverse effects on the important wilderness resources in the area cannot be overemphasized. Not only would the Chimney Bend roadless area be bisected by the pipeline, but further development of shutin gas wells in the southern portion of this unit would disqualify a still larger segment of the area from further wilderness consideration. In addition, the pipeline would facilitate accelerated drilling in at least three other BLM roadless areas and development could occur in an additional three roadless areas. These areas include Rand Coulee (#232), Two Calf Creek (#231), and Armell's Creek (#227). All six of these roadless areas possess high wilderness values, and either border the Missouri Wild and Scenic River or the CM Russell National Wildlife Refuge. The EAR correctly states that "no protection measures could be totally effective in restoring wilderness to an untrammelled state."

Even though full field development is the real issue and the resulting impacts are acknowledged by BLM to be "significant", these impacts are not discussed in the EAR "...because of lack of site specific information and time frame of development." The failure to assess these impacts is a major deficiency and must be corrected.

It is thus the determination of The Wilderness Society that a full-scale programmatic Environmental Impact Statement pursuant to NEPA should be prepared prior to a decision on the FUELCO pipeline for the following reasons:

1) The direct relationship between the FUELCO pipeline and full field development (with 35-40 wells, roads, staging areas, compressor station etc.) constitutes a major federal action significantly affecting the environment and, as such, an EIS is legally required.

2. An EIS is needed to obtain an overview of the situation and to avoid a piecemeal approach to decision-making.

3. An EIS will help to coordinate the pipeline and related full field development decision with the BLM Wilderness Review program. As it now stands, a fragmented decision based on the EAR would be premature and out of sync with the current wilderness review of the numerous intensive inventory units affected.

John F. Fields - October 28, 1979

#21 4. An EIS will uncover a broader range of viable alternatives with perhaps a better balance between development of fossil fuels and protection of wilderness and related resources.

#22 I should also point out that myself and others raised similar concerns about the proposed pipeline at last year's public meeting on the Wild Missouri Management Plan in Helena.

#23 Since the EAR failed to address the question of an EIS I would appreciate a detailed explanation of why an EIS is considered unnecessary in the event a decision is made to go without one.

I greatly appreciate the opportunity to comment on this important decision and the additional time provided for review. Please include this letter in the official record of comment.

Sincerely,

Bill Cunningham

Bill Cunningham
Regional Representative

Mr. Cunningham called BLM on Oct. 30 and requested an additional comment be added to his letter: ~~[illegible]~~ On page 112 of the Upper Missouri Wild and Scenic River Management Plan - Supplemental Document the following statement was made: "No decision will be made on this proposal until after wilderness review has been conducted and appropriate environmental assessment completed." Mr. Cunningham contends that this wilderness review has not been completed at this point in time.

RESPONSE TO THE WILDERNESS SOCIETY

#19. The roadless areas in question are already leased for oil and gas and the lessees are allowed to continue exploratory drilling, by the terms of their lease and the Interim Management Policy and Guidelines for Lands Under Wilderness Review, Dec. 11, 1979. Whether or not Fuelco's application would affect the rate of drilling in these areas is questionable.

#20. Lack of "site specific information" was meant to indicate that we do not know the exact location of successful wells yet to be drilled; therefore, the length and localities of collection lines and roads needed for distributions would only become available after the field is fully developed, (a matter of 10-20 years). The site specific impacts of such gas development have traditionally been considered on a case-by-case basis at the time industry proposes them. The overall general impacts of such oil and gas activities are considered in the BLM Lewistown District Oil and Gas Programmatic EAR.

#21. The Option Summary at the beginning of this Final EA addresses these concerns as "Issues."

#22. These concerns are considered within the EA. Most citizens supported the concept of a pipeline crossing as long as these concerns could be mitigated as pointed-out in Chapter 1 of the Draft. Mitigative measures dealing specifically with wilderness inventory units are given in Chapter 5 of the Final EA.

#23. The Option Summary provides some reasoning as to the level of assessment necessary for this action. The EA is a planning instrument, not a document presenting a decision. It is used to aid the decision maker in the determination of whether or not an EIS should be required.

#24. At the time the Supplemental Document was prepared, the Interim Management Policy and Guidelines for Lands Under Wilderness Review had not been formulated. These policies and procedures were finalized on December 11, 1979, and the decision on Fuelco's application will be made within the constraints of these guidelines.

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CHAPTER 8

INTENSITY OF PUBLIC INTEREST

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INTENSITY OF PUBLIC INTEREST

Public interest in the Fuelco Project has been demonstrated in two ways. The first, generated by BLM, came through a series of public meetings held on the document "A Management Plan for the Upper Missouri Wild and Scenic River" in 1978. Questioned as to whether they would approve, disapprove, or suggest a different location for this pipeline, most people stated that the pipeline should be allowed as long as the line did not seriously detract from the environmental quality of the area. Many added that this pipeline should be of sufficient size to allow for further energy development without the need for additional construction.

Public interest was also shown after several articles appeared in Montana newspapers about the potential adverse effects the pipeline would have on Missouri River paddlefish.

APPENDICES

APPENDIX TABLE 3.1

Station/ Month	Average High Temp.	Average Low Temp.	Average # Days Max. Temp. GE to 90°F	Average # Days Min. Temp. LE 32°F	Average Total Precip. (Inches)	Average Total Snowfall (Inches)	Average Monthly Temp.
ILIAD							
May	87.4	25.2	0.66	3.45	1.95	0.00	54.0
June	93.9	32.1	3.80	0.35	2.39	0.00	62.4
July	99.9	36.2	10.37	0.05	1.42	0.00	69.6
August	101.5	38.7	12.27	0.09	1.42	0.00	67.8
September	92.6	23.1	3.17	5.80	0.76	0.00	56.3
MOBRIDGE							
May	88.2	28.5	1.00	4.93	2.35	0.00	55.4
June	95.6	39.4	4.86	0.26	2.92	0.00	64.2
July	101.6	43.1	15.64	0.00	1.91	0.00	71.8
August	101.6	40.1	14.07	0.00	1.80	0.00	70.2
September	94.0	25.1	3.53	4.78	1.01	0.00	58.1

APPENDIX TABLE 3.2

RIVERBREAKS 10-14' PRECIPITATION ZONE

Dominants in the Climax Vegetation

(Listed in the approximate order of dominance)

Ponderosa pine (Pinus ponderosa)
Rocky Mountain juniper (Juniperus scopulorum)
Limber pine (Pinus flexilis)
Douglas-fir (Pseudotsuga menziesii)
Bluebunch wheatgrass (Agropyron spicatum)
Blue stem (Agropyron smithii)
Thickspike wheatgrass (Agropyron dasystachyum)
Green needlegrass (Stipa viridula)
Prairie sandreed (Calamovilfa longifolia)
Basin wildrye (Elymus cinereus)
Needle and thread (Stipa comata)
Greasewood (Sarcobatus vermiculatus)
Big sagebrush (Artemisia tridentata)
Creeping juniper (Juniperus horizontalis)
Native legumes
Prairie junegrass (Koeleria cristata)

Plants that Increase with Grazing Pressure

(Based primarily on the response to grazing pressure by cattle)

Needle and thread (Stipa comata)
Blue grama (Bouteloua gracilis)
Sandburg bluegrass (Poa secunda)
Prairie junegrass (Koeleria cristata)
Threadleaf sedge (Carex filifolia)
Big sagebrush (Artemisia tridentata)
Rabbitbrush (Chrysothamnus spp.)
Creeping juniper (Juniperus horizontalis)
Fringed sagewort (Artemisia frigida)
Pussytoes (Antennaria spp.)
Hairy golden-aster (Chrysopsis villosa)
Other woody forbs
Annuals

APPENDIX TABLE 3.3

SCIENTIFIC NAMES OF ANIMALS

Common Name	Scientific Name
Mule deer	Odocoileus hemionus
Pronghorn antelope	Antilocapra americana
Bobcat	Lynx rufus
Mink	Mustela vison
Muskrat	Ondatra zibethicus
Beaver	Castor canadensis
Northern grasshopper mouse	Onychomys leucogaster
Western deer mouse	Peromyscus maniculatus
Meadow vole	Microtus pennsylvanicus
Prairie vole	Microtus ochrogaster
Northern pocket gopher	Thomomys talpoides
Least chipmunk	Eutamias minimus
White-tailed jackrabbit	Lepus townsendii
Mountain cottontail	Sylvilagus nuttallii
Porcupine	Erethizon dorsatum
Woodhouse toad	Bufo woodhousei
Boreal chorus frog	Pseudacris triseriata
Leopard frog	Rana pipiens
Sagebrush lizard	Sceloporus graciosus
Western spiny soft shell turtle	Trionyx spiniferus
Painted turtle	Chrysemys picta
Snapping turtle	Chelydra serpentina
Bullsnake	Pituophis catenifer
Plains garter snake	Thamnophis radix
Common garter snake	Thamnophis sirtalis
Prairie rattlesnake	Crotalus viridis
Sage grouse	Centrocercus urophasianus
Sharp-tailed grouse	Pedioecetes phasianellus
Hungarian partridge	Perdix perdix
Ring-necked pheasant	Phasianus colchicus
Canada goose	Branta canadensis
Mallard duck	Anas platyrhynchos

APPENDIX TABLE 3.4

FISH SPECIES RECORDED FOR THE UPPER MISSOURI WILD AND SCENIC RIVER IN MONTANA (FAMILY, SCIENTIFIC AND COMMON NAMES)

ACIPENSERIDAE (Sturgeon family)
- Scaphirhynchus albus · Pallid sturgeon
- Schaphirhynchus platorynchus · Shovelnose sturgeon

POLYONDONTIDAE (Paddlefish family)
- Polyodon spathula ·Paddlefish

HIDONTIDAE (Mooneye family)
- Hiodon alosoides · Goldeye

SALMONIDAE (Trout family)
- Prosopium williamsoni · Mountain whitefish
- Onocorhynchus kisutch · Coho salmon*
- Onocorhynchus nerka · Kokanee*
- Salmo clarkii · Cutthroat trout*
- Salmo gairdneri · Rainbow trout
- Salmo trutta · Brown trout
- Salvelinus fontinalis · Brook trout
- Salvelinus namaycush · Lake trout*

ESOCIDAE (Pike family)
- Esox lucius · Northern pike

CYPRINIDAE (Minnow family)
- Cyprinus carpio ·Carp
- Carassius auratus · Goldfish
- Notemigonus crysoleucas · Gold shiner*
- Phoxinus eos · Northern redbelly dace*
- Phoxinus neogaeus · Finescale dace*
- Hybopsis gracilis · Flathead chub
- Couesius plumbeus · Lake chub*
- Notropis atherinoides · Emerald shiner
- Hybognathus hankinsoni · Brassy minnow
- Hybognathus placitus · Plains minnow*
- Hybognathus nuchalis · Silver minnow
- Pimephales promelas · Fathead minnow
- Rhinichthys cataractae · Longnose dace

CATOSTOMIDAE (Sucker family)
- Carpoides carpio · River carpsucker
- Cycleptus elongatus · Blue sucker
- Ictiobus bubalus · Smallmouth buffalo
- Ictiobus cyprinellus · Bigmouth buffalo
- Moxostoma macrolepidotum · Shorthead redhorse
- Catostomus catostomus · Longnose sucker
- Catostomus commersoni · White sucker
- Catostomus platyrhynchus · Mountain sucker

ICTALURIDAE (Catfish family)
- Ictalurus melas · Black bullhead
- Ictalurus punctatus · Channel catfish
- Noturus flavus · Stonecat

GADIDAE (Codfish family)
- Lota lota · Burbot

GASTEROSTEIDAE (Stickleback family)
- Culaea inconstans · Brook stickleback*

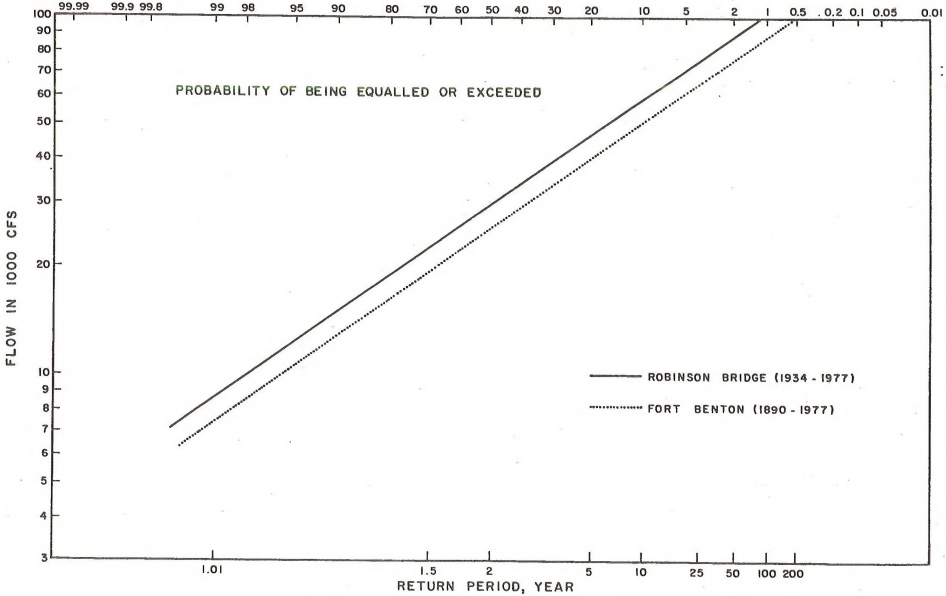
CENTRARCHIDAE (Sunfish family)
- Lepomis macrochirus · Bluegill*
- Micropterus salmoides · Largemouth bass
- Pomoxis annularis · White crappie
- Pomoxis nigromaculatus · Black crappie*

PERCIDAE (Perch family)
- Perca flavescens · Yellow perch
- Stizostedion canadense · Sauger
- Stinzostedion vitreum · Walleye
- Etheostoma exile · Iowa darter*

SCIAENIDAE (Drum family)
- Aplodinotus grunniens · Freshwater drum

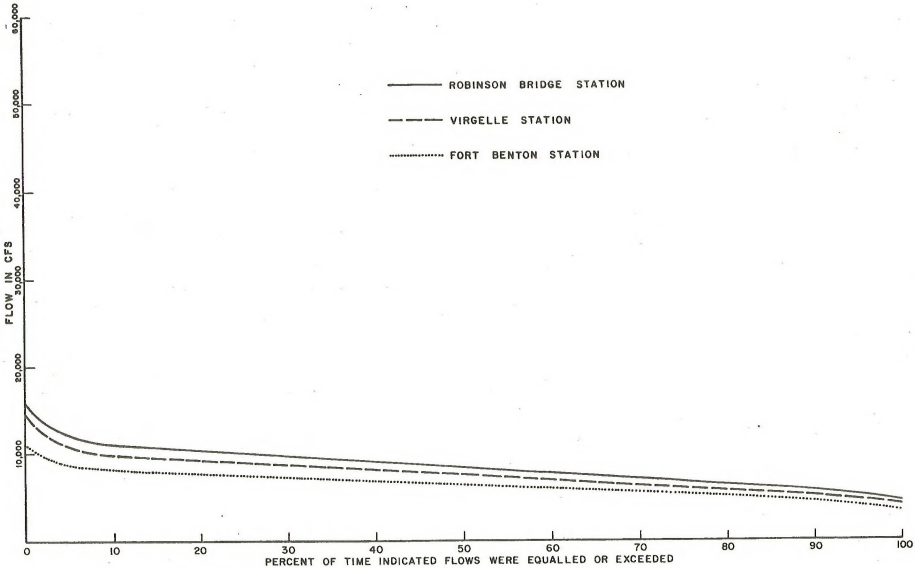
COTTIDAE (Sculpin family)
- Cottus bairdi · Mottled sculpin

* Known distribution is limited to Fort Peck Reservoir or tributaries to the middle Missouri River.



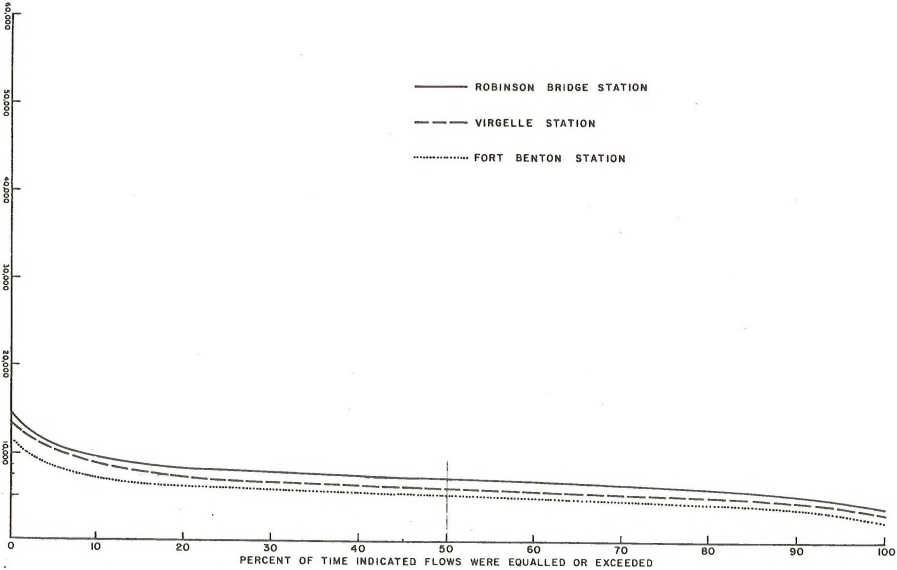
FLOOD FREQUENCY CURVES FOR THE MISSOURI RIVER
AT FORT BENTON AND ROBINSON BRIDGE

APPENDIX FIGURE 3.1

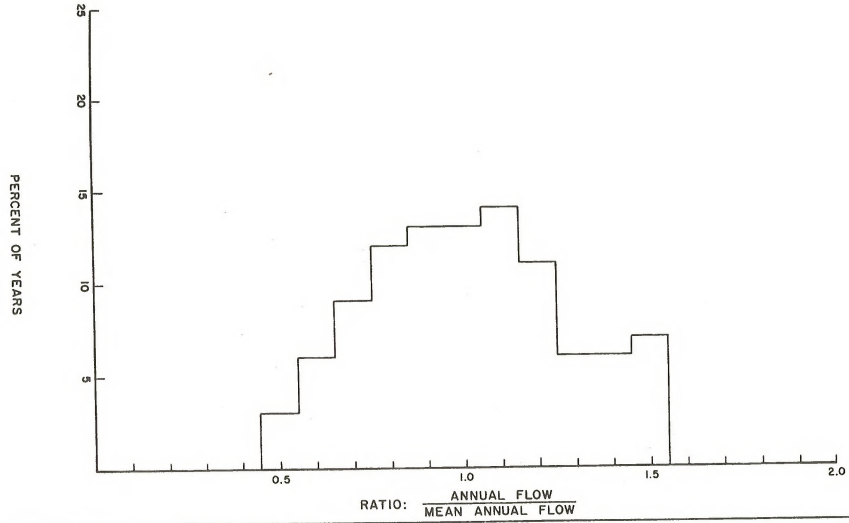


FLOW DURATION CURVES FOR THE MONTH OF AUGUST AT THREE STATIONS ON THE UPPER MISSOURI RIVER (1958 - 1977)

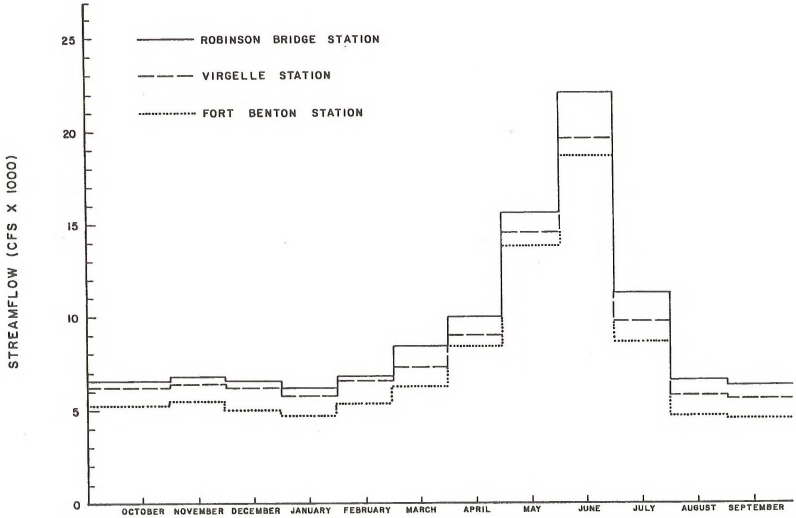
APPENDIX FIGURE 3.3



FLOW DURATION CURVES FOR THE MONTH OF SEPTEMBER AT THREE STATIONS ON THE UPPER MISSOURI RIVER (1958-1977)



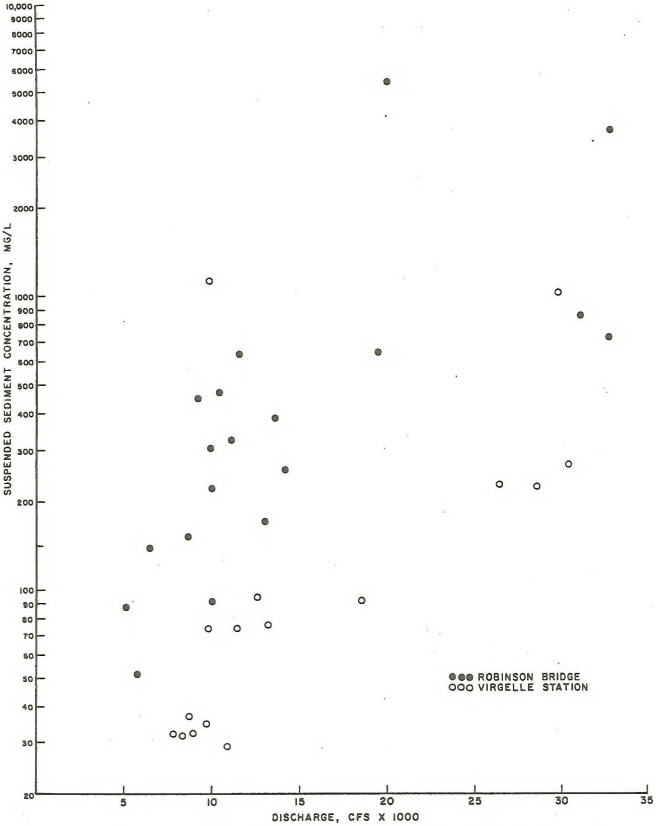
DISTRIBUTION OF ANNUAL STREAMFLOWS
FOR 83 YEARS OF RECORD AT FORT BENTON



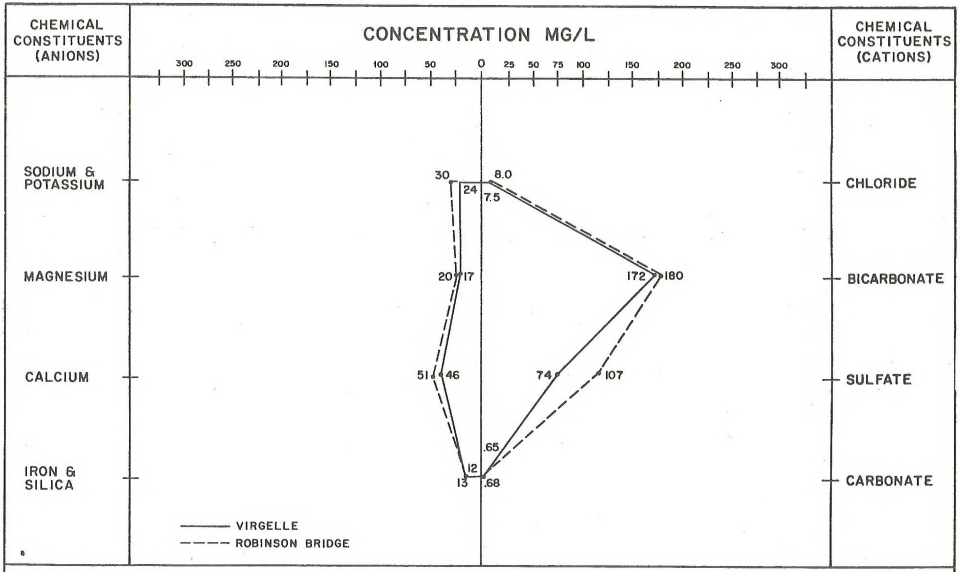
MEAN MONTHLY STREAMFLOW FOR STATIONS
ON THE UPPER MISSOURI RIVER

APPENDIX FIGURE 3.5

APPENDIX FIGURE 3.6



VARIATION IN SUSPENDED SEDIMENT CONCENTRATION
WITH DISCHARGE ON THE MISSOURI RIVER
AT VIRGELLE AND ROBINSON BRIDGE



AVERAGE CONCENTRATION OF MAJOR IONS AND CATIONS OF THE MISSOURI RIVER (U.S.G.S. WATER QUALITY DATA, HELENA)

APPENDIX FIGURE 3.7

APPENDIX FIGURE 3.8

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date	
District	
Planning unit	
Activity	

SECTION A. PROJECT INFORMATION

1. Project name	2. Critical viewpoint number	3. MFP Step III VRM class

4a. LOCATION			b. LOCATION MAP
TOWNSHIP	RANGE	SECTION	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

1. LAND/WATER	FORM	
	LINE	
	COLOR	
	TEX-TURE	
2. VEGETATION	FORM	
	LINE	
	COLOR	
	TEX-TURE	
3. STRUCTURES	FORM	
	LINE	
	COLOR	
	TEX-TURE	

(Continued on page 2)

Form 8400—4 (September 1978)
U.S. Government Printing Office - 78-779-312

SECTION C. PROPOSED ACTIVITY DESCRIPTION

(Refer to BLM Manual Section 8131 for proposed descriptions and requirements)

1. LAND/WATER	FORM	
	LINE	
	COLOR	
	TEXTURE	
2. VEGETATION	FORM	
	LINE	
	COLOR	
	TEXTURE	
3. STRUCTURES	FORM	
	LINE	
	COLOR	
	TEXTURE	

SECTION D. CONTRAST RATING ☐ SHORT TERM ☐ LONG TERM

DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		Strong (3x)	Moderate (2x)	Weak (1x)	None (0x)	Strong (3x)	Moderate (2x)	Weak (1x)	None (0x)	Strong (3x)	Moderate (2x)	Weak (1x)	None (0x)
ELEMENTS	Form (4x)	12	8	4	0	12	8	4	0	12	8	4	0
	Line (3x)	9	6	3	0	9	6	3	0	9	6	3	0
	Color (2x)	6	4	2	0	6	4	2	0	6	4	2	0
	Texture (1x)	3	2	1	0	3	2	1	0	3	2	1	0
TOTALS													

1a. Maximum element contrast

b. Maximum feature contrast

2. Does project design meet visual resource management requirements? ☐ Yes ☐ No

If "no," (or if rating is over maximum allowable) redesign project in section E, concentrating on feature/element of greatest contrast. If contrast is acceptable, this does not prelude additional mitigating measures; propose as stipulations, and list in section E.

Evaluator *(signature)*

Date

SECTION E. REDESIGN, STIPULATIONS, MITIGATING MEASURES

SECTION F. DESCRIPTION OF ACTIVITY *(Redesigned)*

1. LAND/WATER				2. VEGETATION				3. STRUCTURES			
FORM	LINE	COLOR	TEX-TURE	FORM	LINE	COLOR	TEX-TURE	FORM	LINE	COLOR	TEX-TURE

(Continued on page 4)

SECTION G. CONTRAST RATING *(Redesigned)*

DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		Strong (3x)	Moderate (2x)	Weak (1x)	None (0x)	Strong (3x)	Moderate (2x)	Weak (1x)	None (0x)	Strong (3x)	Moderate (2x)	Weak (1x)	None (0x)
ELEMENTS	Form (4x)	12	8	4	0	12	8	4	0	12	8	4	0
	Line (3x)	9	6	3	0	9	6	3	0	9	6	3	0
	Color (2x)	6	4	2	0	6	4	2	0	6	4	2	0
	Texture (1x)	3	2	1	0	3	2	1	0	3	2	1	0
TOTALS													

1a. Maximum element contrast

b. Minimum feature contrast

2. Does project design meet visual resource management requirements? ☐ Yes ☐ No

If "no," request services of district landscape architect, and describe amount of time and when required.

3. Fiscal year 19

4. Which third? *(check one)* ☐ First ☐ Second ☐ Third

5. TIME REQUIRED

DAYS	MAN-MONTHS

SECTION H. RECOMMENDATIONS

1. Recommendation of staff landscape architect if allowable contrast rating cannot be met

Signature	Date

2. Decision and justification of Area or District Manager

Signature	Date

3. Check appropriate box: ☐ Proceed with project/activity as mitigated ☐ Cancel project/activity as proposed

Signature	Date

GLOSSARY

GLOSSARY

ALLUVIUM. A general term for all sediments deposited by moving waters.
BFC. Billion cubic feet
BICOMPONENT. Consisting of two parts or components
CALCAREOUS. Containing calcium carbonate ($CaCO_3$)
CONCRETION. Particles of like chemical composition, when free to move, come together and form nodules of various sizes and shapes
CONFORMABLY. Strata, or groups of strata, lying one above another in parallel order with the youngest rocks to the top and oldest to the bottom of the strata
CORROVIVITY. Chemical erosion of rocks or soils
DENDRITIC. A drainage pattern characterized by irregular branching joining the main channel at all angles
DIURNAL. Daily
FANS. An accumulation of debris brought down by a stream descending through a steep ravine with deposition in the plain below, where the debris spreads out in the shape of a fan
FAULTING. Displacement in the earth's crust along fracture zones
FAUNA. The animals of any place or time that live in association with each other
FOSSILIFEROUS. Containing organic remains; An assembledge of fossil remains
GRANULAR. Composed of grains or granules
HORIZONS. The various layers that comprise a soil
INCISED. Cut down into, as a river cuts into a plateau
INTERBEDDED. Occurring between beds or lying in a bed parallel to other beds of a different material
INVERTEBRATE. Without a backbone or spinal column
MASS WASTING. A general term for a variety of processes by which large masses of earth material are moved downslope by gravity
MCF. 1,000 cubic feet
MMCF. Million cubic feet
PERMEABLE. Capacity of a rock stratum or soil for transmitting a fluid
RESIDUUM. Soil formed in place by the disintegration and decomposition of rocks and the weathering of the mineral material
R/W. Right-of-way
SCORIA. Volcanic slag
SEDIMENTARY. Descriptive term for rock formed by water or wind deposited material as sandstone or by precipitation from water as limestone
STRATA. A section of a formation that consists, throughout, of approximatelythe same type of rock material
TERRAIN. An area of ground considered as to its extent and natural features in relation to its use for a particular operation or purpose
TOPOGRAPHY. Relief or contour of the land
VERTEBRATE. Animals possessing a spinal column and more or less boney parts of an internal skeleton

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